KINGSWAY

MATHEMATICS

BLUE BOOK I

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BLUE BOOK 1

S. EWART WILLIAMS B.Sc.

Deputy Director of Education, Staffordshire;
Formerly Headmaster, Intermediate School, Brierley Hill
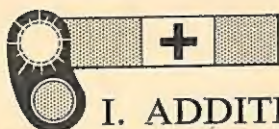
EVANS BROTHERS LIMITED
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I. ADDITION AND SUBTRACTION
SIMPLE RULES

EXERCISE 1. MAGIC SQUARES

A line drawn across a square from one corner to the opposite corner is known as a **diagonal**.

Look at the numbers in this square and be ready to answer the following questions:

(*a*) What is the sum of the numbers:
    8, 3 and 4 in the column on the left?

(*b*) What is the sum of the numbers:
    4, 9 and 2 in the top row?

(*c*) What is the sum of the numbers:
    4, 5 and 6 along the diagonal?

(*d*) Find the sum of the numbers in each column, in each row, and along each diagonal. What do you notice about your answers?

4	9	2
3	5	7
8	1	6

These numbers make what is known as a **magic square**. They are so arranged that the sum of the numbers in each column, in each row, and along each diagonal, is the same.

Copy the following divided squares into your book and fill in the missing numbers to make magic squares.

a

5	10	3
4	6	
	2	7

b

8		6
	9	
12		10

c

7	12	5
6		10
11		9

d

10		8
	11	
14		12

e

6	11	4
	7	
	3	

f

11		9
	12	
15		

ATTENDANCE			
DAY	MORNING	AFTERNOON	TOTALS
MONDAY	300	302	612
TUESDAY	308	314	613
WEDNESDAY	210	312	721
THURSDAY	352	346	056
FRIDAY	2013	200	636
TOTALS	252	204	6083

There is no excuse for wrong answers in addition.   Test your results by :
(i) adding from the bottom line upwards,
(ii) adding from the top line downwards.

1. Find the total of each of the following:

(a) 86	(b) 37	(c) 56	(d) 186
49	95	83	99
38	16	29	454
—	—	—	68
			—

(e) 562	(f) 84	(g) 592	(h) 7,054	(i) 4,678
38	376	382	4,807	9,599
389	38	657	3,087	4,977
77	409	608	4,547	5,532
—	—	509	—	7,600
		—		—

ATTENDANCE			
DAY	MORNING	AFTERNOON	TOTALS
MONDAY	310	315	(c)
TUESDAY	326	322	(d)
WEDNESDAY	319	317	(e)
THURSDAY	331	328	(f)
FRIDAY	316	309	(g)
Totals	(a)	(b)	(t)

2. (a) Make a copy of the attendance board.   Find the total attendances made during the mornings and during the afternoons of the week. Place your answers in the spaces (a) and (b).

(b) Find the total attendance for each day of the week.   Place your answers in the spaces (c) to (g).

(c) What is the total of the numbers you have written in the spaces (c) to (g)?   Place your answer in the space (t).   This answer is called the *grand total*.

(d) Is the *grand total* equal to the sum of the numbers you have placed in the spaces (a) and (b)?

3. (a) Make a copy of the attendance board shown below. Find the total attendance for each half-day of the week and place your results in the spaces (a) to (j).

(b) Find the total attendances made by each class during the week and place your results in the spaces (k), (l), (m), (n).

(c) What is the total of the numbers you have written in the last column? This answer (t) is known as the *grand total*.

(d) Find out if the *grand total* equals the sum of the numbers you have written in the spaces (a) to (j) of the bottom line.

CLASS	MONDAY		TUESDAY		WEDNESDAY		THURSDAY		FRIDAY		TOTALS
	M	A	M	A	M	A	M	A	M	A	
I	38	38	37	36	40	40	39	37	38	37	(k)
II	37	37	36	38	40	39	38	39	39	39	(l)
III	40	40	39	39	38	39	39	37	39	39	(m)
IV	32	35	36	35	35	36	36	36	35	34	(n)
Totals	(a)	(b)	(c)	(d.)	(e)	(f)	(g)	(h.)	(i)	(j)	(t)

ATTENDANCE

4. Find the sum of the following numbers: Thirty-two; Three thousand and two; Three thousand, two hundred; Three thousand and twenty.

5. Make a copy of the table below. Add the rows and columns. Find and check the *grand total*.

306	472	561	391	287	574	
27	165	58	209	36	86	
178	92	43	78	114	253	
264	77	159	25	293	67	

6. What is the total of: 2,206, 593 and 1,748 ?

7. Find the total of: Twenty-three; Two thousand and three; Twenty thousand and twenty; Two hundred and two.

8. What is the sum of: One thousand, one hundred and one; Ten thousand and eleven; Ten thousand one hundred and ten?

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EXERCISE 3. THE SCHOOL PHOTOGRAPHER

The answer to a subtraction sum is easily checked. The second line of the sum added to the answer should be equal to the top line of the sum.

1. Find the answers to the following subtraction sums, and check.

(a) 97
  32

(b) 93
  36

(c) 264
  89

(d) 407
  38

(e) 593
  247

(f) 804
  165

(g) 5,238
  2,079

(h) 6,408
  574

(i) 9,076
  809

(j) 8,003
  7,085

2. (a) Make a copy of this table. It shows that the School Photographer sent 52 photographs of Class I and that 37 of these were sold. Find the number left unsold and place your answer in the space (a).

(b) Find the number of photographs left unsold in each class. Place your answers in the spaces (b) to (f).

(c) Find the total of each column. Is the total of the first column equal to the sum of the totals of the second and third columns?

W. Snapper   SCHOOL PHOTOGRAPHER

CLASS	SENT	SOLD	UNSOLD
I	52	37	(a)
II	61	46	(b)
III	53	45	(c)
IV	44	39	(d)
V	35	26	(e)
VI	47	38	(f)
Totals	(g)	(h)	(i)

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3. Copy this table into your book and fill in the numbers missing from the spaces (*a*) to (*g*).

Check your work *in each row* by finding if the number in the first column is equal to the sum of the numbers in the second and third columns.

	SCHOOL PHOTOGRAPHER		
CLASS	SENT	SOLD	UNSOLD
I	47	(a)	9
II	46	39	(b)
III	(c)	28	14
IV	(d)	26	(e)
Totals	169	(f)	(g)

W. Snapper

4. Find the difference between five thousand, five hundred and five thousand and fifty-five.

5. What must be added to one thousand, three hundred and sixty-seven to make two thousand and two?

6. Copy the following tables into your book. Fill in the missing figures. Find and check the *grand totals* (*t*).

A

23	22	15		92
	19	24	9	
28		41	13	
31	6		27	
99	73	97		(t)

B

17	11		9	50
	12	10		33
6		18	22	
12	17			52
44	54		48	(t)

C

	26	5		55
23		10	27	
34	25		24	90
8		29		79
69	114		83	(t)

D

		36	2	64
35	19			73
	14	28	7	
4	37		25	84
98	80		50	(t)

EXERCISE 4.   LEAGUE TABLES

In arranging the places of football and netball teams in League Tables, points are awarded in this way:

Two (2) points for each win.   One (1) point for each draw.

In the list of schools given in Tables 1 and 2, you will see that ALL SAINTS BOYS have received 7 points.   They gained 4 (or 2×2) points for the two games which they won, and 3 points for the three games which were drawn. ALL SAINTS GIRLS have played 10 games: 5 were won and 3 were lost; they must, therefore, have drawn 10—5—3, or 2 games.

1. (a) Make a copy of Tables 1 and 2 and fill in all blank spaces.
   (b) Arrange the teams in order, according to the number of points gained by each.

Table 1. FOOTBALL LEAGUE (Boys)					
Name of School	GAMES				POINTS
	PLAYED	WON	DRAWN	LOST	
ALL SAINTS	10	2	3		7
DERBY ROAD	10		3	3	
PARK ROAD	10	2		2	
ST. GILES	10	2	2		
VICTORIA STREET	10	7		3	
WEST END	10		4	2	

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Table 2. NETBALL LEAGUE (Girls)					
Name of School	GAMES				POINTS
	PLAYED	WON	DRAWN	LOST	
ALL SAINTS	10	5	.	3	
DERBY ROAD	10	1	3		
PARK ROAD	10		2	6	
ST. GILES	10	6		1	
VICTORIA STREET	10	6	2		
WEST END	10		2	5	

2. Look at the table below.

   (a) How many points will Brook Street get for the ten games they have won?

   (b) How many games has Brook Street drawn?

   (c) How many games did they play?

   (d) Copy the table and fill in all blank spaces.

Name of School	GAMES				POINTS
	PLAYED	WON	DRAWN	LOST	
BROOK STREET		10		6	24
HILL STREET	22	6	3		
MILL STREET	21		7		23
NEW ROAD		10	6	8	
PARK ROAD	24		3	10	
RODNEY LANE	22	2			9
SOUTH STREET			4	12	34
THAMES STREET	20	6		5	
WATER STREET	21		4		28

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EXERCISE 5. PROBLEMS

1. In a school library there are 736 books. Of these, 173 are History books, 158 are Geography books, 65 are Science books, and the rest are English books. How many English books are there in this library? Check your answer.

2. The total area of the British Isles is 120,000 square miles. The area of England and Wales is 58,000 square miles, and the area of Ireland 32,000 square miles; what is the area of Scotland? Check your answer.

3. A school had 346 children on the registers at the beginning of a year. During the year, 79 children left and 59 were admitted. How many children were on the registers at the end of the year?

4. In a game of cricket Harry, William and Tom scored 67 runs in all. William and Tom scored 53 runs, and Harry scored 15 runs less than Tom. Find how many runs each boy made.

5. Jack has 83 marbles and Alfred has 25. How many has Jack gained from Alfred if they each had the same number at the beginning of their play?

6. The distance from London to Durham through Grantham and Doncaster is 264 miles. Grantham is 152 miles from Durham, and Doncaster is 165 miles from London. Find the distance from:
   - (a) Durham to Doncaster;
   - (b) London to Grantham;
   - (c) Doncaster to Grantham.

7. An arithmetic book contains 168 pages. Another book contains 144 pages. How many pages is the first book greater than the second?

8. A box contained 144 screws. How many have been used if there are 59 now left in the box?
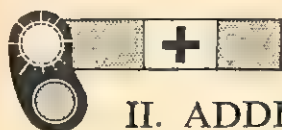
II. ADDITION AND SUBTRACTION
COMPOUND RULES

SOMETHING TO READ: THE STORY OF MEASURING

In the bible, we read that Goliath was a giant " *whose height was six cubits and a span.*" What is a *cubit?* What is a *span?*

Long ago, before there were any tape measures or rulers, people measured by using parts of their body; that is, their **limbs.** For example, the length of the fore-arm from the elbow to the tip of the middle finger was called a **cubit.** It was about 18 inches long.

Other **limb measurements** were the **digit,** the **palm,** the **span,** the **foot,** and the **fathom.** The **digit** was the width of the middle finger; the **palm** was the width of the hand; the **span** was the distance from the tip of the thumb to the tip of the little finger of the outstretched hand; and the **fathom** was the distance between the tips of the middle fingers of the outstretched arms.

These lengths were connected by a table.

4 DIGITS = 1 PALM
3 PALMS = 1 SPAN
2 SPANS = 1 CUBIT
4 CUBITS = 1 FATHOM

DIGIT   PALM   SPAN
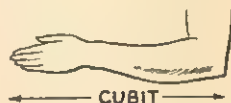
CUBIT
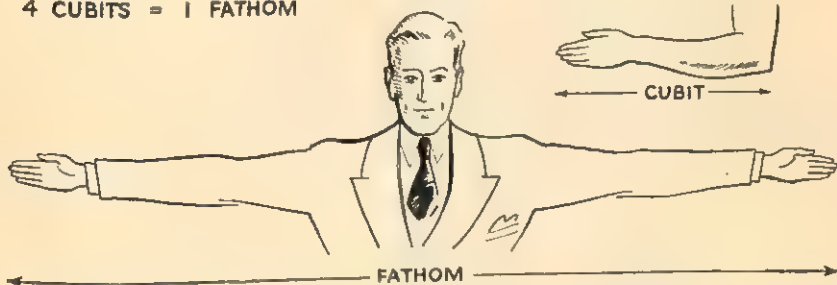
FATHOM

From this table, you will see that a span is about 9 inches, a palm is about 3 inches, a digit is about ¾ inch and a fathom is about 6 feet.

Goliath's height was 6 cubits and 1 span; that is, about 9 ft. 9 in.!

The illustration shows a woman measuring cloth. What length is she measuring?

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EXERCISE 6.　BEHIND THE COUNTER

> **LEARN**
>
> | | | |
> |---|---|---|
> | 4 farthings | = 1 | penny (d.) |
> | 12 pence (d.) | = 1 | shilling (s.) |
> | 20 shillings (s.) or 240 pence (d.) | = 1 | pound (£) |
>
> | | | |
> |---|---|---|
> | A guinea | = | 21 shillings or £1 1s. |
> | A crown | = | 5 shillings (5/–) |
> | A half-crown | = | 2 shillings and 6 pence (2/6) |
> | A florin | = | 2 shillings (2/–) |

1. Total the following bills for customers who have made small purchases:

   (a) 3d.,　4½d.,　6d.,　7½d.

   (b) 2½d.,　7½d.,　9d.,　1/3.

   (c) 6d.,　8½d.,　11d.,　1/9.

   (d) 4½d.,　1/4,　11½d.

   (e) 1½d.,　5½d.,　8d.,　1/2.

   (f) 3½d.,　1/1,　11½d.

   (g) 1/2,　9½d.,　6½d.,　5d.

   (h) 9d.,　8½d.,　2/6.

   (i) 2/4,　6½d.,　8d.,　1/8.

   (j) 8½d.,　1/9,　5½d.,　1/7.

(k) 6½d., 2/8, 4½d. (l) 3/6, 10½d., 1/5.
(m) 9d., 1/10½, 1/9. (n) 2/4, 7½d., 1/8.
(o) 4d., 1/11½, 7½d. (p) 10½d., 2/11, 5½d.
(q) 1/6, 3/9½, 10d. (r) 2/8½, 6½d., 1/10.
(s) 2/6, 11d., 4½d. (t) 3/11, 8½d., 1/9.

2. Find the change in each of the following:

(a) 5½d. from 1s. (b) 6½d. from 2s.
(c) 9½d. from 2/6. (d) 1½d. from 2s.
(e) 1/10 from 2/6. (f) 2/8½d. from 10s.
(g) 3/5 from 10s. (h) 11/2 from £1.
(i) 12/9 from £1. (j) 17/4½ from £1.
(k) 16/8½ from £1. (l) 5/11 from three half-crowns.
(m) 10/3½ from 12/6. (n) £1 1s. 9d. from £1 10s.
(o) £1 12s. 5d. from £2. (p) £1 1s. 7d. from 30s.
(q) £1 18s. 10½d. from £2. (r) 14/4½d. from £1.

3. Find the totals of the following and check your results (as in Exercise 2)

(a) s.	d.	(b) £	s.	d.	(c) £	s.	d.	(d) £	s.	d.
15	6	1	12	7	5	10	8½	6	5	9
11	8	1	7	3	1	11	5	5	2	5½
6	9	2	17	6	4	13	4½	2	13	3½
12	9	3	12	4	7	9	5½		3	7½
5	5		18	7	5	15	3½	3	10	0

4. Copy the following table into your book. Add the lines and the columns. Find and check the *grand total*.

£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
5	10	7	6	16	9	3	9	1	2	10	8			
4	11	11	3	12	8	1	14	10	1	18	8			
1	7	6	3	17	4	2	6	7	2	16	10			

5. Work the following subtraction sums and check your answers (as in Exercise 3).

(a) s.	d.	(b) s.	d.	(c) £	s.	d.	(d) £	s.	d.
14	3	18	1½	1	6	4¼	4	7	6
8	5½	9	10¾		17	8½	1	18	9¼

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EXERCISE 7. MEASURING

LEARN

LIQUID MEASURE

2 pints (pt.)	= 1 quart (qt.)
4 quarts (qt.) or	
8 pints (pt.)	= 1 gallon (gal.)

LONG MEASURE

12 inches (in.)	= 1 foot (ft.)
3 feet (ft.) or	
36 inches (in.)	= 1 yard (yd.)
22 yards (yd.)	= 1 chain (ch.)
10 chains (ch.) or	
220 yards (yd.)	= 1 furlong (fur.)
8 furlongs (fur.) or	
1760 yards (yd.)	= 1 mile

1. Find the totals of the following and check your results (as in Exercise 2).

<table>
<tr><td>(a)</td><td>ch.</td><td>yd.</td></tr>
<tr><td></td><td>2</td><td>19</td></tr>
<tr><td></td><td>1</td><td>20</td></tr>
<tr><td></td><td>3</td><td>10</td></tr>
<tr><td></td><td>3</td><td>17</td></tr>
</table>

<table>
<tr><td>(b)</td><td>fur.</td><td>ch.</td></tr>
<tr><td></td><td>3</td><td>3</td></tr>
<tr><td></td><td>2</td><td>5</td></tr>
<tr><td></td><td>2</td><td>7</td></tr>
<tr><td></td><td>5</td><td>9</td></tr>
</table>

<table>
<tr><td>(c)</td><td>ml.</td><td>fur.</td></tr>
<tr><td></td><td>6</td><td>2</td></tr>
<tr><td></td><td>3</td><td>6</td></tr>
<tr><td></td><td>3</td><td>7</td></tr>
</table>

<table>
<tr><td>(d)</td><td>yd.</td><td>ft.</td><td>in.</td></tr>
<tr><td></td><td>5</td><td>0</td><td>6</td></tr>
<tr><td></td><td>3</td><td>1</td><td>9</td></tr>
<tr><td></td><td>2</td><td>2</td><td>8</td></tr>
<tr><td></td><td>2</td><td>1</td><td>9</td></tr>
</table>

<table>
<tr><td>(e)</td><td>ml.</td><td>fur.</td><td>ch.</td></tr>
<tr><td></td><td>5</td><td>4</td><td>3</td></tr>
<tr><td></td><td>3</td><td>6</td><td>7</td></tr>
<tr><td></td><td>2</td><td>7</td><td>8</td></tr>
<tr><td></td><td>1</td><td>6</td><td>5</td></tr>
</table>

<table>
<tr><td>(f)</td><td>gal.</td><td>qt.</td><td>pt.</td></tr>
<tr><td></td><td>3</td><td>3</td><td>0</td></tr>
<tr><td></td><td>2</td><td>3</td><td>1</td></tr>
<tr><td></td><td>2</td><td>3</td><td>0</td></tr>
<tr><td></td><td>1</td><td>1</td><td>1</td></tr>
</table>

<table>
<tr><td>(g)</td><td>gal.</td><td>qt.</td><td>pt.</td></tr>
<tr><td></td><td>3</td><td>2</td><td>1</td></tr>
<tr><td></td><td>1</td><td>3</td><td>0</td></tr>
<tr><td></td><td>1</td><td>2</td><td>1</td></tr>
<tr><td></td><td></td><td>1</td><td>1</td></tr>
</table>

<table>
<tr><td>(h)</td><td>yd.</td><td>ft.</td><td>in.</td></tr>
<tr><td></td><td>4</td><td>2</td><td>5</td></tr>
<tr><td></td><td>1</td><td>2</td><td>7</td></tr>
<tr><td></td><td>3</td><td>1</td><td>10</td></tr>
<tr><td></td><td></td><td>1</td><td>8</td></tr>
</table>

<table>
<tr><td>(i)</td><td>ml.</td><td>fur.</td><td>ch.</td></tr>
<tr><td></td><td>2</td><td>3</td><td>6</td></tr>
<tr><td></td><td></td><td>5</td><td>8</td></tr>
<tr><td></td><td>4</td><td>2</td><td>4</td></tr>
<tr><td></td><td>3</td><td>4</td><td>2</td></tr>
</table>

2. Subtract the second line from the first line in each of the above sums—
(a) to (i) and check your answers (as in Exercise 3).

EXERCISE 8.　WEIGHING

1. Find the totals of the following and check your results (as in Exercise 2).

(a)
lb.	oz.
3	0
2	9
1	15
1	13

(b)
st.	lb.
7	2
3	$8\frac{1}{2}$
1	$10\frac{1}{2}$
	$7\frac{3}{4}$

(c)
cwt.	qr.
3	1
2	3
5	3
2	2

(d)
tons	cwt.
10	10
7	15
9	6
11	17

(e)
tons	cwt.	qr.
7	14	1
5	6	2
	12	3

(f)
cwt.	qr.	lb.
1	3	11
1	1	17
3	0	22

(g)
st.	lb.	oz.
3	8	12
1	9	7
2	6	11

(h)
tons	cwt.	qr.
3	12	2
	17	0
4	6	3

(i)
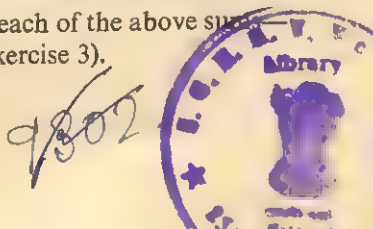| cwt.	qr.	lb.
7	2	12
4	1	19
	3	21

(j)
st.	lb.	oz.
3	12	14
2	13	8
	7	13

2. Subtract the second line from the first line in each of the above sums
(a) to (j), and check your answers (as in Exercise 3).

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EXERCISE 9. PROBLEMS

1. A man gave his wife his week's wages, except 15s. which he kept as pocket money. With the money she received, the wife paid the butcher 14/3½, the grocer 28/7½, the cobbler 3/6, and gave her four children 2d. each. If she now had 26/6 left, how much did her husband earn that week?

2. Tom has saved £2 17s. 9d. towards the cost of a bicycle. How much more will he need if the price of the cycle is 5½ guineas?

3. (a) A settee and two armchairs are marked £42 13s. 6d. If the price of the settee is £21 18s. 6d., what is the value of one of the armchairs?
   (b) During a sale these chairs were offered at £9 16s. 6d. each, and the settee at £20 18s. 6d. How much would be saved by buying the chairs and settee during the sale?
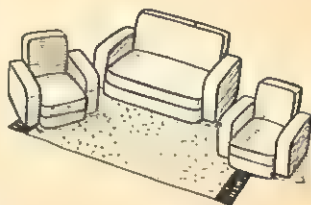
4. A milkman began his round with a 10-gallon churn full of milk. How much milk did he sell if he returned with 1 gal. 3 qt. 1 pt. in the churn?

5. What is the total weight of the following six parcels: 7 lb. 13½ oz.; 2 lb. 9 oz.; 5 lb. 7 oz.; 6 lb. 11½ oz.; 4 lb. 15½ oz.; 5½ lb.?

6. The following quantities of oil have been taken from a full 50-gallon drum: 2 gal. 3 qt.; 1 gal. 3 qt.; 3 gal. 2 qt. 1 pt.; and 4 gal. 1 qt. 1 pt. Find the quantity of oil left in the drum.

7. A house 24 ft. wide was built on a piece of land with a frontage of 11½ yards. What width *in feet* would be left at the side of the house for a garage?

8. A butcher cut up a large joint of meat weighing 20½ lb. into five smaller joints. Four of these smaller joints weighed 4¼ lb.; 3 lb. 8 oz.; 5 lb. 6 oz.; and 2 lb. 12 oz. What was the weight of the fifth joint?

9. A motor lorry and its load weighed 2 tons 19 cwt. 3 qr. Find the weight of the load if the lorry weighed 15½ cwt.

10. A shop-soiled car was sold for £399. How much is this below the catalogue price of 410 guineas?

III. MULTIPLICATION AND DIVISION
SIMPLE RULES

EXERCISE 10. MULTIPLICATION

If you look at the face of a clock, you will probably find that the hours are marked by Roman figures. The first five numbers are shown thus:

I	II	III	IIII	V
one	two	three	four	five
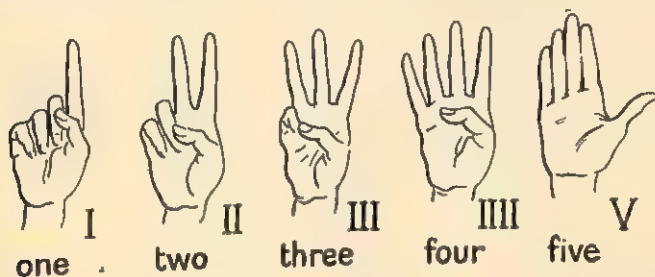
but six is written as VI (five and one), seven as VII (five and two), while ten is written as two fives ✕ or X.

Place Value: The Roman figure V always means five units, but our figure 5 may stand for five units, or five tens, or five hundreds, etc., according to its **place** in a row of figures.

THOUSANDS			UNITS		
H	T	U	H	T	U
				5	7
			5	7	0
		5	7	0	0

Look at the numbers in the table and be ready to answer these questions:

(a) What is the first number?

(b) What is the second number?

(c) What is the third number?

(d) What is the value of the figure 7 in the first number?

(e) What is the value of the figure 7 in the second number?

(f) Has the value of this 7 become greater, or less, by being moved to the left?

(g) What is the value of the figure 7 in the third number?

(h) How many times is the value of the figure 7 increased by being moved one place to the left?

(i) What are the values of the three 5's in these numbers?

(j) Is the value of this 5 increased ten times by each move of one place to the left?

LEARN

TO MULTIPLY BY 10, move the figures one place to the left.

TO MULTIPLY BY 100, move the figures two places to the left.

1. Write down the answers of the following:

(a) 36 × 10   (b) 27 × 10   (c) 36 × 100

(d) 27 × 100   (e) 43 × 10   (f) 43 × 20

(g) 43 × 30   (h) 271 × 70   (i) 62 × 100

A Multiplication Strip

273 × 267
267

273 × 267
267
54600 = 273 × 200

(j) 62 × 300   (k) 129 × 100   (l) 129 × 700
(m) 273 × 200   (n) 273 × 60   (o) 273 × 7

> **LEARN**
>
> The answer of a multiplication sum is called the PRODUCT.
> The product of 4 and 8 is 32.

2. Add your last three answers (*m, n, o*) together to find the *product* of 273 × 267. (See Multiplication Strip below.)

3. Multiply 478 by (*a*) 46, (*b*) 37, (*c*) 58, (*d*) 69, (*e*) 222, (*f*) 307.

4. Find the products of : (*a*) 536 and 29; (*b*) 492 and 78; (*c*) 746 and 89; (*d*) 527 and 38; (*e*) 253 and 235; (*f*) 306 and 105.

5. Find the number of ounces in (*a*) 17 lb.; (*b*) 109 lb.; (*c*) 345 lb.

6. How many pounds are there in (*a*) 1 cwt.; (*b*) 5 cwt.; (*c*) 29 cwt.?

7. There are 1,760 yards in 1 mile.   How many yards are there in:
   (*a*) 7 miles; (*b*) 13 miles; (*c*) 48 miles?

8. Find the number of inches in (*a*) 23 yards; (*b*) 76 yards; (*c*) 1,760 yards.

9. Copy the following multiplication sums into your book and fill in the missing figures (*).

   (*a*) 2*   (*b*) *6   (*c*) 7*2   (*d*) **3
           4   5   7   8
         ----   ----   -----   -----
          112   180   5,264   6,184

10. Find the products of the following numbers:

    (*a*) 56 × 10   (*b*) 56 × 5   (*c*) 92 × 10   (*d*) 92 × 5
    (*e*) 48 × 100   (*f*) 48 × 50   (*g*) 48 × 25   (*h*) 64 × 100
    (*i*) 64 × 50   (*j*) 64 × 25   (*k*) 208 × 50   (*l*) 208 × 25

> **LEARN**
>
> To multiply by 5, multiply by 10 and divide by 2.
> To multiply by 50, multiply by 100 and divide by 2.
> To multiply by 25, multiply by 100 and divide by 4.

273 × 267	273 × 267	273 × 267
267	267	267
54600 = 273 × 200	54600 = 273 × 200	54600 = 273 × 200
16380 = 273 × 60	16380 = 273 × 60	16380 = 273 × 60
	1911 = 273 × 7	1911 = 273 × 7
		72891 = 273 × 267

	$2745 \div 53$	$\begin{array}{r} 5 \\ 53\overline{)2745} \\ 265 \end{array}$	$\begin{array}{r} 5 \\ 53\overline{)2745} \\ 265 \\ 9 \end{array}$	$\begin{array}{r} 5 \\ 53\overline{)2745} \\ 265 \\ \hline 95 \end{array}$
A **Division** **Strip**	$53\overline{)2745}$			

EXERCISE 11. DIVISION

The division sign ($\div$) consists of a line and two dots. These dots are often omitted and instead of writing (say) 15 divided by 3 as $15 \div 3$, we write $\frac{15}{3}$.

$$1116 \div 3 = \frac{1116}{3} = 372$$

1. Work these sums:

   (a) $234 \div 2$ (b) $375 \div 3$ (c) $609 \div 4$ (d) $418 \div 5$

   (e) $362 \div 6$ (f) $612 \div 7$ (g) $1,216 \div 8$ (h) $3,407 \div 9$

2. Divide 9,856 by   (a) 8,   (b) 7,   (c) 11.

3. Use the answers of the last question, and write down the answers of:
   9,856 divided by   (a) 16,   (b) 14,   (c) 28,   (d) 22.

4. Write down the number of gallons in :

   (a) 104 pints,   (b) 568 pints,   (c) 1,008 pints.

5. Write down the number of feet in :

   (a) 180 inches,   (b) 252 inches,   (c) 324 inches.

6. Divide 10,080 by   (a) 36,   (b) 112,   (c) 160,   (d) 240.

7. Using the answers of the last question, write down:

   (a) the number of hundredweights in 10,080 pounds;

   (b) the number of pounds (£) in 10,080 pence;

   (c) the number of yards in 10,080 inches.

8. (a) What is the *remainder* when 3,782 is divided by 46?

   (b) What is the smallest number that can be taken from 3,782 to give a number that can be divided exactly by 46?   Check your answer.

   (c) What is the smallest number that must be added to 3,782 to give a number that can be divided exactly by 46?   Check your answer.

9. Divide 3,696 by   (a) 16,   (b) 22,   (c) 24,   (d) 28.

```
      51              51
53)2745         53)2745         2745
   265             265          ──── = 51 rem 42
    95              95            53
    53              53
                    42
```

10. Using the answers of the last question, write down:

    (a) the number of quarter hundredweights in 3,696 pounds;
    (b) the number of pounds in 3,696 ounces;
    (c) the number of chains in 3,696 yards.

> LEARN
> The answer of a division sum is called the QUOTIENT.
> The quotient is 4 when 32 is divided by 8.

11. In each of the following pairs, divide the first number by the second number and obtain the **quotients** and **remainders**:

    (a) 1,094 and 23.   (b) 10,419 and 34.   (c) 15,096 and 29.

12. Work the following sums and check your answers by multiplication:

    (a) 3,769 ÷ 31   (b) 7,003 ÷ 43   (c) 24,607 ÷ 51
    (d) 5,990 ÷ 62   (e) 5,007 ÷ 49   (f) 3,963 ÷ 37

LIQUID MEASURES

27
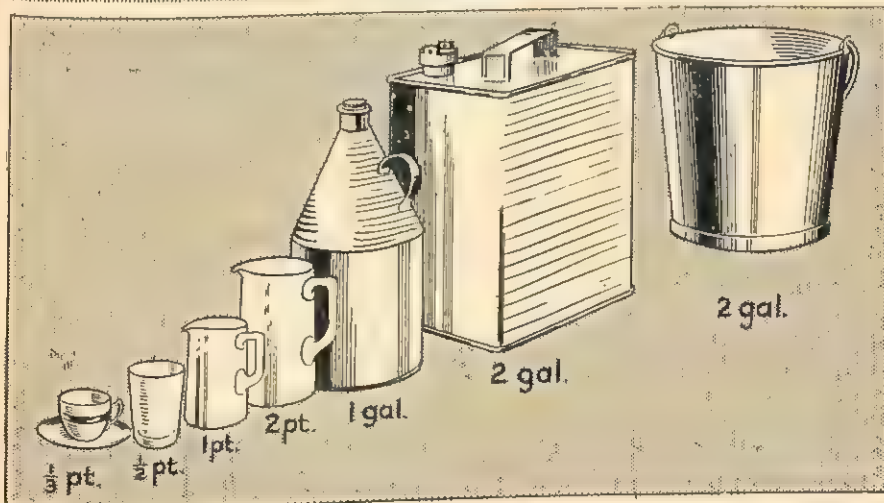
EXERCISE 12.   SCORES AND HUNDREDS

> **LEARN**
>   A SCORE = 20.
>   A GROSS = 12 dozen = 12 × 12 = 144.
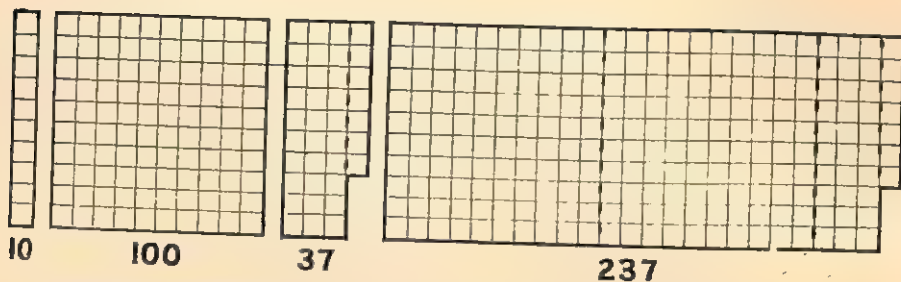
10   100   37   237

Look at the figures above and be ready to answer these questions:

(a) How many tens are there in 30?
(b) How many tens are there in 37?
(c) What is the remainder when 37 is divided by 10?
(d) How many tens are there in 100?
(e) How many tens are there in 230?
(f) How many tens are there in 237?
(g) What is the remainder when 237 is divided by 10?
(h) How many hundreds are there in 237?
(i) What is the remainder when 237 is divided by 100?

PLACE VALUE: We have already seen that the moving of the figures to the **left increased** their value ten times.   In the same way, by looking at the Table (H.T.U.) on page 24 you will see that the movement of figures to the **right decreases** their value ten times.

LEARN

TO DIVIDE BY 10, move the figures one place to the right.

TO DIVIDE BY 100, move the figures two places to the right.

1. (a) How many tens are there in: 30,   300,   40,   510,   730?
   (b) How many tens are there in 36?
   (c) What is the remainder when 36 is divided by 10?

(d) How many tens are there in 518?

(e) What is the remainder when 518 is divided by 10?

(f) Write down the quotients and the remainders when these numbers are divided by 10:   63,   98,   204,   213,   777.

(g) Write 52,   67,   93,   216, and 333 florins as £ and s.

2. (a) How many hundreds are there in 300;   500;   6,000;   7,000?

(b) How many hundreds are there in 765?

(c) What is the remainder when 765 is divided by 100?

(d) How many hundreds are there in 2,567?

(e) What is the remainder when 2,567 is divided by 100?

(f) Write down the quotients and the remainders when these numbers are divided by 100:   728,   536,   3,722,   5,630.
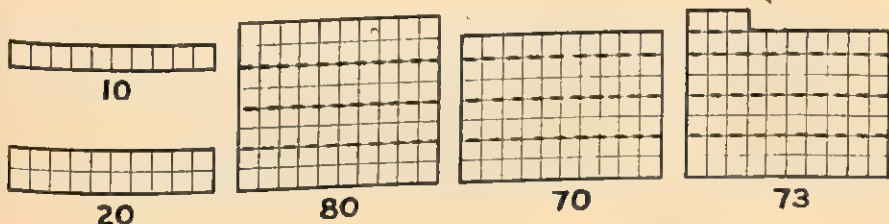
3. Write down the quotients and the remainders of the following:

(a) 567 ÷ 10   (b) 382 ÷ 10   (c) 593   ÷ 10   (d) 2,739 ÷ 10
(e) 567 ÷ 100   (f) 382 ÷ 100   (g) 2,739 ÷ 100   (h) 3,905 ÷ 100

Look at the figures above and be ready to answer these questions:

(a) How many tens are there in 80?

(b) How many twenties are there in 80?

(c) How many tens are there in 70?

(d) How many twenties are there in 70?

(e) What is the remainder when 70 is divided by 20?

(f) What is the remainder when 73 is divided by 20?

4. (a) How many tens are there in 260?

(b) How many twenties are there in 260?

(c) How many tens are there in 250?

(d) How many twenties are there in 250?

(e) What is the remainder when 250 is divided by 20?

5. Copy and complete the following:

(a) 236 cwt. = ... tons ... cwt.   (b)   598 cwt. = ... tons ... cwt.
(c) 703 cwt. = ... tons ... cwt.   (d) 2,365 cwt. = ... tons ... cwt.
(e) 703s.   = £ ...   ... s.   (f)   399s.   = £ ...   ... s.
(g) 1,555s.   = £ ...   ... s.   (h) 2,070s.   = £ ..   ... s

29

IV. REDUCTION AND CONCRETE DIVISION

EXERCISE 13. REDUCTION

1. (a) How many pennies are there in 1s., 3s., 3s. 6d.?
   (b) How many sixpences are there in 1s., 2s., 6s., 10s. 6d.?
   (c) How many twopences are there in 1s., 2s., 1s. 8d., 2s. 6d.?
   (d) How many farthings are there in 1d. 2d., 5d., 8½d.?
   (e) How many shillings are there in £1, £2, £2 10s., £3 8s.?
   (f) A two-shilling piece is known as a *florin*. How many florins are there in £1, £2, £3 10s., £5 16s.?

2. (a) How many shillings are there in £5 12s., £3 16s., £9 12s.?
   (b) How many sixpences are there in 112s., 76s., 192s.?
   (c) How many shillings are there in £2 19s., £6 13s.?
   (d) How many twopences are there in £2 19s., £6 13s.?

> £5 3s. 6d. = 103s. 6d. = 207 sixpences.
> £5 12s. 8d. = 112s. 8d. = 676 twopences.

3. Using your answers to the last question, copy and complete the following:
   (a) £5 12s. = ... s. = ... sixpences.
   (b) £3 16s. = ... s. = ... sixpences.
   (c) £9 12s. = ... s. = ... sixpences.
   (d) £2 19s. = ... s. = ... twopences.
   (e) £6 13s. = ... s. = ... twopences.

4. Change:
   (a) 3s. 2¾d. to farthings.
   (b) 7s. 10½d. to halfpence.
   (c) £1 8s. 5d. to pence.
   (d) 9s. 3d. to three-halfpences.
   (e) £2 11s. 3d. to threepences.
   (f) £1 8s. 8d. to fourpences.
   (g) £6 10s. 6d. to sixpences.
   (h) £10 10s. to florins.

5. (a) Bring 495 threepences to shillings and pence.
   (b) Give 123 shillings in pounds (£'s) and shillings.
   (c) From your answers, copy and complete the following:
       495 threepences = . . . s. . . . d. = £ . . . . . . s. . . . d.

> 247 threepences = 61s. 9d. = £3 1s. 9d.

6. Change: (a) 333 farthings to s. d.
   (b) 1,000 pence to £ s. d.
   (c) 279 twopences to £ s. d.
   (d) 236 threepences to £ s.

7. Check each of your answers in Question 4.

8. Check each of your answers in Question 6.

9. (a) How many 1d. stamps can be bought for 17/6?
   (b) How many 1½d. stamps can be bought for £1 2s. 6d.?
   (c) How many 2d. stamps can be bought for 18/4?
   (d) How many 3d. stamps can be bought for £1 5s.?
   (e) How many 4d. stamps can be bought for 15/8?

10. How many weeks will a girl take to pay for a bicycle costing £6 12s. 6d if she pays 2/6 a week?

11. How long will it take to pay for a gramophone costing £18 5s. if payments of 5/– each have to be made weekly?

12. Find the total value of these photographs: 319 postcard size at 4d. each; 107 large size at 6d. each; and 83 mounted photographs at 2/– each.

13. A bus conductor sold the following tickets during one of his trips: 217 at 1d. each; 50 at 1½d. each; 104 at 2d. each; 67 at 3d. each; and 19 at 4d. each. What is the total amount of money which he took?

14. From the following items, find the total amount of money sent to the bank: 38 halfpennies; 126 pennies; 49 threepences; 92 sixpences; 83 shillings; 19 florins; and 29 half-crowns.
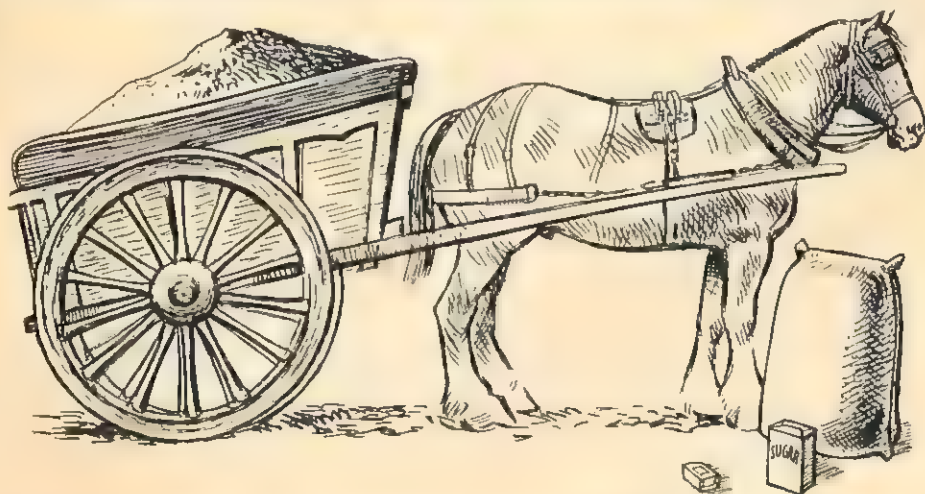
EXERCISE 14. DIVISION OF ONE QUANTITY (MONEY, WEIGHT, LENGTH, ETC.) BY ANOTHER QUANTITY OF THE SAME KIND

1. (a) Change 1s. 8d., 3s. 4d., 4s. 2d., 6s. 8d. to pence.
   (b) How many times is 10d. contained in 1s. 8d., 3s. 4d., 4s. 2d.?
   (c) How many times is 7d. contained in 1s. 9d., 2s. 11d., 5s. 3d.?
   (d) How many times is 4 oz. contained in 1 lb., 2¼ lb., 3½ lb.?
   (e) How many times is 9 inches contained in 2 ft. 3 in., 3 ft. 9 in.?

How many times is 3s. 6d. contained in £2 5s. 6d.? This sum may be worked in either of the two following ways:

(a) No. of times $= \dfrac{£2\ 5s.\ 6d.}{3s.\ 6d.} = \dfrac{45s.\ 6d.}{3s.\ 6d.} = \dfrac{546d.}{42d.} = 13.$

or

(b) No. of times $= \dfrac{£2\ 5s.\ 6d.}{3s.\ 6d.} = \dfrac{45s.\ 6d.}{3s.\ 6d.} = \dfrac{91\ \text{sixpences}}{7\ \text{sixpences}} = 13.$

---

2. How many times is 7s. 6d. contained in £6 7s. 6d.? Work this sum by filling in the missing figures (*) below:

   (a) No. of times $= \dfrac{£6\ 7s.\ 6d.}{7s.\ 6d.} = \dfrac{*s.\ *d.}{7s.\ 6d.} = \dfrac{*d.}{*d.} = *.$

   (b) No. of times $= \dfrac{£6\ 7s.\ 6d.}{7s.\ 6d.} = \dfrac{*\ \text{half-crowns}}{*\ \text{half-crowns}} = *.$

   Which of these two ways do you think is the easier?

3. How many times is the smaller amount contained in the larger?
   (a) 1s. 6d.; 4s. 6d.   (b) £1 15s.; £21.
   (c) 2s. 6d.; 12s. 6d.   (d) £1 12s. 6d.; £22 15s.

4. How many pounds of sugar at 5d. per lb. can be bought for:
   (a) 2/6, (b) 3/4, (c) 4/2?

5. How many books at 1/4 each can be bought for:
   (a) 12/-, (b) £1 12s., (c) £2 6s. 8d.?

6. How many yards of material at 3/1½ a yard can be bought for:
   (a) 9/4½, (b) 12/6, (c) £1 8s. 1½d.?

7. When coal is 4/4 per cwt., what weight can be bought for:
   (a) 17/4, (b) £1 1s. 8d., (c) £1 14s. 8d.?

8. My milk bill for last month amounted to 10/10. What quantity of milk did I buy if it was sold at 5d. a pint?

9. How many payments of 9/6 each will be required to pay for a garden shed costing £15 4s.?

10. How long will it take to pay for a wireless set costing £15 10s., if payments of 15/6 each have to be paid monthly?

JANUARY

1

LEARN

Thirty days hath September,
April, June and November,
All the rest have thirty one,
Excepting February alone
Which has but twenty-eight days clear
And twenty-nine in each Leap Year
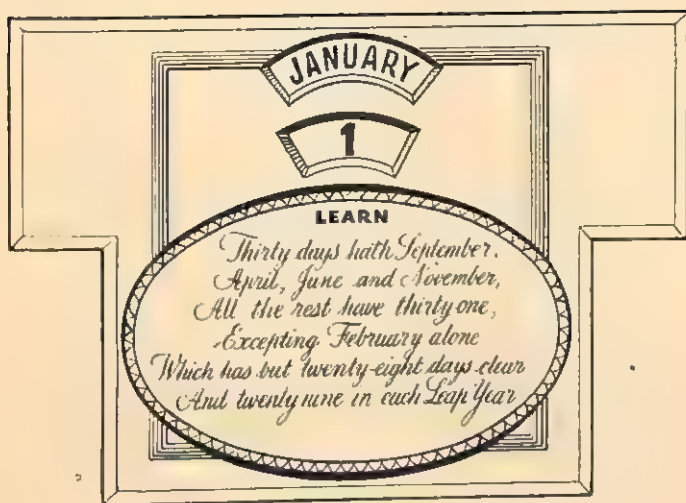
EXERCISE 15. PROBLEMS

1. A newsagent supplies 166 houses with a daily paper each week-day, and 72 houses with a Sunday paper each week.
   (a) How many papers does he sell in four weeks?
   (b) What should he receive in four weeks if the daily papers are a penny each and the Sunday papers are twopence each?

2. (a) What change would you receive from a £1 note after buying 150 three-halfpenny stamps?
   (b) How many halfpenny stamps could you buy with this change?

3. At a school concert there were 1,023 people; 497 of these were men and women, and 235 were boys. How many girls were there?

4. (a) A farmer bought 37 lambs at 23/– each, and 19 lambs at 26/– each. How many shillings will he gain if he sells all the lambs at 29/– each?
   (b) Give this answer in £ s.

5. A firm used 1,378 halfpenny, 508 penny, 976 three-halfpenny, and 718 twopenny stamps. What was the total cost?

6. (a) Find the number of days from 16th April to 23rd July.
   (b) Find the number of days from 16th April to 23rd July, both dates inclusive.

7. Find the number of days from: 3rd January to 27th March, and from 7th September to 25th December.

8. What is the number of days, both dates inclusive, from 15th June to 29th September and from 25th December to 5th March?

V. REVISION

EXERCISE 16. LOOKING BACKWARDS

First Glance

1. (*a*) Write the following numbers in words: 505; 5,005; 15,050; 10,005.
   (*b*) Write the following numbers in figures:

   Seven thousand and seven; Six thousand, one hundred and seventeen; Four thousand, one hundred and seven; Three thousand, one hundred and seventy; One thousand, seven hundred.

2. What must be added to 4,829 to make 6,724?

3. Make a copy of this table, and fill in the blank spaces. Find and check the grand total (*t*).

16		13	15	66
7		9	21	56
10				
	47	39	47	(*t*)

4. Complete the magic square:

6		
10	8	18

Second Glance

1. How many gross of exercise books will be needed for a school of 336 children, if each child uses 9 books?
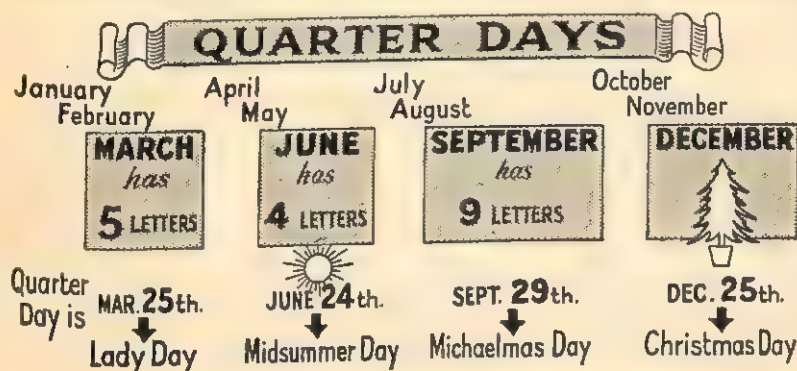
34

2. Copy these subtraction sums into your book and fill in the missing line in each case:

(a) £	s.	d.	(b) tons	cwt.	qr.	(c) yd.	ft.	in.
*	**	*	17	12	1	7	0	2
2	16	8½	**	**	*	3	2	10
3	13	7½	4	14	2	*	*	*

3. What change shall I receive if I pay for the following goods with four £1 notes?

   1 shirt at 40/6; 1 pair of socks at 6/6 a pair; ½ doz. handkerchiefs at 1/6 each; 1 muffler at 18/9.

4. (a) How many boxes of matches could be filled from a pile of 4,000 if each box holds 48 matches?
   (b) How many matches would be left over?
   (c) How many matches would you need to fill another box?

Third Glance

1. A boy is paid at the rate of 6d. an hour. How much would he earn in a week when he worked for 47 hours?

2. How many toys at 5/3 each could a tradesman buy for 5 guineas?

3. How much money would Jane have on her birthday, 17th July, if she had been saving 1d. a day since the 7th March?
   (7th March and 17th July to be included.)

4. A pail *half-filled* with water weighs 18 lb. If the pail weighs 3 lb. when empty, what will it weigh when full of water?

QUARTER DAYS

January February	April May	July August	October November
MARCH *has* **5** LETTERS	**JUNE** *has* **4** LETTERS	**SEPTEMBER** *has* **9** LETTERS	**DECEMBER**

Quarter Day is — MAR. **25**th. → Lady Day — JUNE **24**th. → Midsummer Day — SEPT. **29**th. → Michaelmas Day — DEC. **25**th. → Christmas Day

EXERCISE 17. MECHANICAL SUMS

Set A. Reading Numbers

Write the following numbers in words:

1. 506   **2.** 3,072   **3.** 3,003   **4.** 12,100   **5.** 3,904

Set B. Writing Numbers

Write the following numbers:

1. Two hundred and two.
2. Four hundred and ten.
3. One thousand, three hundred and thirty.
4. Twenty-five thousand and six.
5. Six thousand, one hundred and six.

Set C. Addition

1.
368
209
451
165
28

2.

£	s.	d.
3	12	6½
1	11	9¾
2	10	5
4	17	4½

3.

ml.	fur.	chn.
7	5	2
3	7	6
1	3	5
2	1	9

4.
1,562
897
205
2,358
3,073

5.

£	s.	d.
67	10	9
43	19	10
15	15	0
27	12	8

6.

chn.	yd.
4	17
1	20
2	15
1	9

7.
23,002
17,867
9,530
4,679
27,035

8.

£	s.	d.
306	12	0
109	15	8
84	4	6
123	7	9

9.

lb.	oz.
5	10
1	12
2	14
1	8

10.
92,035
80,096
8,573
467
10,509

11.

yd.	ft.	in.
3	2	5
1	2	11
	1	7
1	0	9

12.

st.	lb.
6	10¼
3	13¾
2	9½
1	7½

13. £	s.	d.
1	2	6
	18	8
	12	3
1	0·	7

14. yd.	ft.	in.
17	0	3
9	2	7
10	2	0
7	1	6

15. cwt.	qr.	lb.
7	1	20
5	2	24
2	0	12
3	3	19

16. tons	cwt.	qr.
17	13	1
10	18	3
5	10	2
12	15	3

17. gal.	qt.	pt.
7	0	0
2	2	1
3	3	1
1	2	1

18. hr.	min.
7	15
4	35
3	20
1	45

Set D. Subtraction

In each of the sums in Set C take the second line from the first line.

Set E. Multiplication and Division

Check each answer.
1. 567 × 7
2. 247 × 43
3. 723 × 208
4. 593 × 316

5. 2,068 × 89
6. 8,543 ÷ 9
7. 5,275 ÷ 23

8. 37,098 ÷ 46
9. 78,043 ÷ 79
10. 36,429 ÷ 93

Set F. Reduction

1. Change £7 12s. 3d. to pence.
2. Change £13 8s. 8d. to fourpences.
3. Change £27 7s. 6d. to half-crowns.
4. Change 532 farthings to s. d.
5. Change 784 three-halfpences to £ s.
6. Change 361 sixpences to £ s. d.
7. How many times is 7s. 6d. contained in £14 5s.?
8. How many times is 15s. contained in £6 15s.?
9. How many times is £3 2s. 6d. contained in £100?
10. How many times is 13s. 6d. contained in £10 2s. 6d.?

Set G. Dates

Find the number of days from:
1. 1st March to 21st May.
2. 3rd June to 22nd November.
3. 5th July to 19th September.
4. 15th October to 26th February.
5. 24th April to 15th July.
6. 23rd March to 13th June.

£	s.	d.
1	16	7 × 18
		18

£	s.	d.
1	16	7 × 18
		18
		126

£	s.	d.
1	16	7 × 18
		18
		6
	10	126

VI. MULTIPLICATION AND DIVISION
COMPOUND RULES

EXERCISE 18. MULTIPLICATION OF MONEY

> **LEARN**
> | 60 seconds (sec.) | = 1 minute (min.) |
> |---|---|
> | 60 minutes (min.) | = 1 hour (hr.) |
> | 24 hours (hr.) | = 1 day (day) |
> | 7 days (days) | = 1 week (wk.) |
> | 52 weeks or | |
> | 365 days | = 1 year |
> | 366 days | = 1 leap year |

1. Work the following:

    (a) 3s 7d. × 8   (b) 2s. $7\frac{1}{2}d$ × 5   (c) 1s. $5\frac{3}{4}d$. × 7

2. Use the answers obtained in the last question to find:

    (a) 3s. 7d × 16   (b) 2s. $7\frac{1}{2}d$. × 15   (c) 1s. $5\frac{3}{4}d$. × 28

3. Work the following:

    (a) 5s. 8d. × 4   (b) 7s. $10\frac{1}{2}d$. × 10

    (c) 6s. $3\frac{1}{4}d$. × 12   (d) £1 16s. 7d. × 6

4. Use the answers of the last question to find the value of:

    (a) 5s. 8d. × 16   (b) 7s. $10\frac{1}{2}d$. × 30

    (c) 6s. $3\frac{1}{4}$ × 24   (d) £1 16s. 7d. × 18

5. (a) What is the value of 7 × 18? From this answer, find the value of:

    7d. × 18, in *shillings and pence*.

    (b) What is the value of 16 × 18? From this answer, find the value of:

    16s. × 18, in *pounds (£'s) and shillings*.

    (c) What is the value of: £1 × 18?

    (d) By adding together the answers of (a), (b), and (c), find the value of:

    £1 16s. 7d. × 18. Compare the result with that obtained in Question 4 (d).

£	s.	d.		£	s.	d.		£	s.	d.	
1	16	7	× 18	1	18	7	× 18	1	16	7	× 18
		18				18				18	
	18	6			18	6		32	18	6	
	10	126		14	10	126		14	10	126	
	108				108			18	108		
	180				180			32	180		
	298			14	298				298		

Work the following:

6. 2s 2d. × (a) 7, (b) 14, (c) 17, (d) 23, (e) 31.

7. 4s. 7½d. × (a) 12, (b) 48, (c) 13, (d) 52, (e) 37.

8. £3 5s. 6d. × (a) 5, (b) 9, (c) 12, (d) 19, (e) 26.

9. Find the cost of:
   (a) 5 lb. of butter at 1/8 per lb.
   (b) 39 pints of milk at 5d. a pint.
   (c) 13 cwt. of coal at 4/2 per cwt.
   (d) 19 yd. of curtain material at 5/8½ a yard.
   (e) 46 ft. of boarding at 9½d. a foot.

10. What will a man earn in 46 hours if paid at the rate of 3/3½ an hour?

11. What is the yearly rent of a house for which 19/8 is paid weekly?

12. What is the yearly rent of a house at £3 18s. 6d. a calendar month?

SCALES
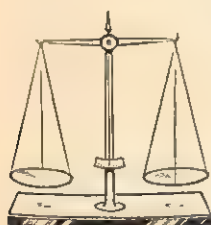
Weighs oz. and lb.
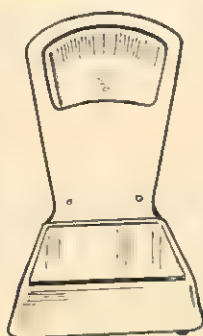
Weighs st. and lb.
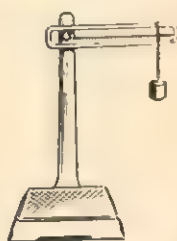
Weighs cwt.
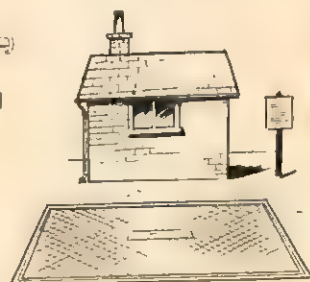
Weighs tons

A Division Strip

£19 6 9 ÷ 17

£	s.	d.
17)19	6	9

£	s.	d.
1		
17)19	6	9
17		
2		

£.	s.	d.
1		
17)19	6	9
17	40	
2	46	

EXERCISE 19.   DIVISION OF MONEY

$$£10 \; 12s. \; 4d. \div 7 = \frac{£10 \; 12s. \; 4d.}{7} = £1 \; 10s. \; 4d.$$

1. Work the following:
   (a) £8 6s. 3d. ÷ 7   (b) £7 10s. 5d. ÷ 5   (c) £11 12s. 10½d. ÷ 9.

2. (a) If £19 were divided among 17 boys, how many *pounds* would each
       boy receive?   How much would be left over?
   (b) If £19 6s. were divided among 17 boys, how many *pounds* would each
       boy receive?   How much would be left over in this case?   Bring
       this remainder to *shillings*.
   (c) If 46s. were divided among 17 boys, how many *shillings* would each
       boy receive?   What would be left over?
   (d) If 46s. 9d. were divided among 17 boys, how many *shillings* would
       each boy receive?   How much would remain in this case?   Bring
       this remainder to *pence*.
   (e) If 153 pence were divided among 17 boys, how many *pennies* would
       each boy receive?

   In Question 2, you have divided £19 6s. 9d. by 17.   This sum is worked
in the strip at the top of the page.   You will see that by writing the answer
above the £19 6s. 9d., the space below can be used for the large numbers in
your working.

3. (a) Find the value of: £20 12s. 3d. divided by 17.
   (b) Check your result by multiplying the answer by 17.

   Work the following, and check your answers by multiplication:
4. £8 18s. 9d. ÷ (a) 5,   (b) 11,   (c) 13,   (d) 15.
5. £21 14s.   ÷ (a) 8,   (b) 12,   (c) 28,   (d) 31.
6. Work the following and check your answers by division:
       (a) 1/9½ × 20   (b) 1/5½ × 47   (c) 11/8 × 13   (d) £2 16s. 2d. × 52.

| £	s.	d.		£	s.	d.		£	s.	d.
1	2			1	2			1	2	9
17)19	6	9		17)19	6	9		17)19	6	9
17	40			17	40	144		17	40	144
2	46			2	46	153		2	46	153
	34				34				34	153
	12				12				12	

7. Find the cost of:
    (a) 1 yard of dress material, when 7 yards cost 23s. 0½d.
    (b) 1 cwt. of coal, when 1 ton costs £4 3s. 4d.
    (c) 1½ gallons of petrol, when 6 gallons cost 12s. 9d.
    (d) 1 lb. of seed, when 14 lb. cost £1 12s. 8d.
    (e) 5 books, when 15 copies of the book cost £1 6s. 3d.

8. A sideboard costing £18 6s. is to be paid for by 12 equal payments. What is the amount of each payment?

9. A chair costing £12 14s. is paid for by 24 equal payments. What is the amount of each payment?

10. Work the following, and in each case give the value of the remainder:
    (a) £1 1s. 10d. ÷ 6   (b) £34 14s. 11d. ÷ 16
    (c) £39 7s. ÷ 26   (d) £53 14s. 7d. ÷ 39

The rates at which we travel

4 ml. an hour

12 ml. an hour

18 ml. an hour

40 ml. an hour

60 ml. an hour
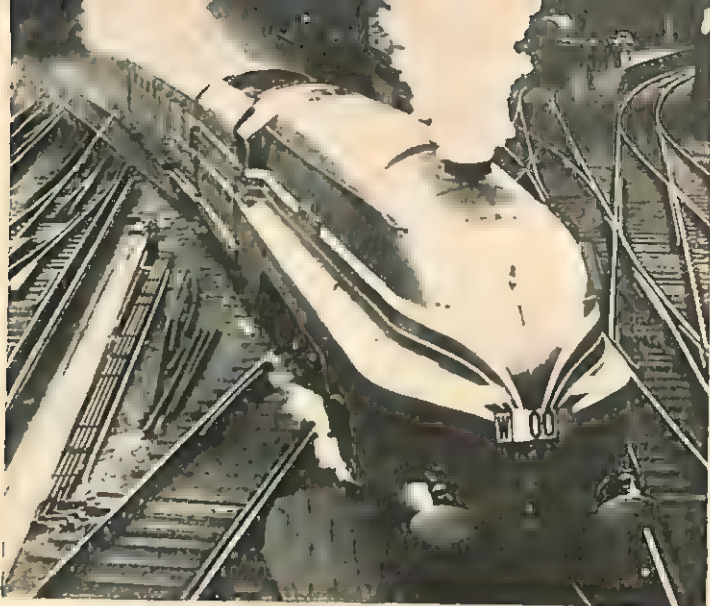
VII. TIME-TABLES, PRICE LISTS AND APPROXIMATE ANSWERS

EXERCISE 20. RAILWAY AND BUS TIME-TABLES

1. A train leaves Cardiff at 9.52 a.m. and arrives in Carmarthen at 12.38 p.m. How long does this journey take?

2. (a) A train can travel from Liverpool to Manchester in 45 minutes. If a train departs from Liverpool at 8.30 a.m., at what time will it arrive in Manchester?

   (b) Find the missing times in the time-table:

| Liverpool ....dep. | 8.15 a.m. | 9.10 a.m. | 10.25 a.m. | 11.40 a.m. |
| Manchester ......arr. | * | * | * | * |

3. It takes an express train 1 hour 20 minutes to travel from London to Oxford. Copy and complete the following time-table:

| London ....dep. | 9.00 a.m. | 10.20 a.m. | 11.50 a.m. | 12.10 p.m. |
| Oxford ....arr. | * | * | * | * |

4. An ordinary train takes 25 minutes to travel from Bath to Bristol. Copy and complete the following time-table:

| Bath ....dep. | * | * | * | * |
| Bristol ....arr. | 9.35 a.m. | 10.59 a.m. | 11.15 a.m. | 12.10 p.m. |

5. To travel from Birmingham to Wolverhampton, an express train takes 19 minutes, and an ordinary train takes 35 minutes. Copy and complete the following time-tables:

(a)

EXPRESS TRAINS			
Birmingham ......dep.	9.10 a.m.	*	11.08 a.m.	*
Wolverhampton ...arr.	*	10.19 a.m.	*	12.15 p.m.

(b)

ORDINARY TRAINS			
Birmingham ......dep.	9.30 a.m.	*	12.40 p.m.	*
Wolverhampton ...arr.	*	11.25 a.m.	*	2.15 p.m.

6. From the time-table of a bus service which runs from Liverpool to London, find how long the bus takes to travel:

Liverpool	8.10 a.m.
Birkenhead	8.55 a.m.
Chester	9.35 a.m.
Birmingham	12.46 p.m.
Warwick	1.47 p.m.
Stratford	2.08 p.m.
Oxford	4.17 p.m.
High Wycombe ..	5.30 p.m.
London	6.45 p.m.

(a) from Liverpool to Birkenhead;

(b) from Chester to Birmingham;

(c) from Warwick to Oxford;

(d) from Liverpool to London.

Height of fence	PALES			
	5" apart per yard	3" apart per yard	2" apart per yard	1" apart per yard
3 ft	2/2	2/7	3/1	3/7
4 ft	2/8	3/4	4/-	4/3
5 ft	3/3	4/-	4/11	5/7
6 ft	3/9	4/7	5/7	6/8

EXERCISE 21.   USING A PRICE LIST

The picture shows a portion of sheep-fencing.   Look at the price list and answer the following questions:

1. Find the cost of 30 yards of the fencing, 3 ft. high, when the pales are
   (a) 5 in.,   (b) 3 in.,   (c) 2 in.,   (d) 1 in. apart.

2. Find the cost of 26 yards of the fencing with the pales 5 in. apart, when the fence is (a) 3 ft.,   (b) 4 ft.,   (c) 5 ft.,   (d) 6 ft. high.

3. Find the cost of:
   (a) 34 yards of fencing, 4 ft. high, pales 3 in. apart.
   (b) 58 yards of fencing, 5 ft. high, pales 1 in. apart.
   (c) 72 yards of fencing, 3 ft. high, pales 2 in. apart.

4. A piece of ground, 20½ yd. long and 14½ yd. wide, is to be fenced with pales 5 in. apart and 6 ft. high.
   (a) What length of fencing will be required?
   (b) What will this fencing cost?

5. What would be the cost of fencing the piece of ground in the last question with pales 3 in. apart and 6 ft. high?

6. (a) What is the cost of 60 yards of fencing, 6 ft. high, pales 3 in. apart?
   (b) What is the cost of 60 yards of fencing, 5 ft. high, pales 1 in. apart?
   (c) What is the difference in the cost of (a) and (b)?

7. (a) What is the difference in cost between 1 yard of fencing 3 ft. high, pales 1 in. apart and 1 yard of fencing 5 ft. high, pales 1 in. apart?
   (b) What is the difference in cost between 50 yards of fencing, 3 ft. high, pales 1 in. apart and 50 yards, 5 ft. high pales, 1 in. apart?

8. The distance round a garden is 46 yards.   It is to be fenced with pales 5 ft. high.   How much can be saved by using fencing with pales 5 in. apart instead of fencing with pales 3 in. apart?

EXERCISE 22. APPROXIMATE, OR ROUGH, ANSWERS

It is of great importance that you should be accurate, or right, in all your work ; and you have been told to test, or check, your results whenever possible. You should also make it a practice to find an approximate, or rough, answer to your problem before actually working it.

Consider the sum £5 13s. 7d. × 11.
   (i) £5 13s. 7d. is greater than £5 10s. Then your answer will be greater than £5 10s. × 11; that is, GREATER THAN £60 10s.
   (ii) £5 13s. 7d. is less than £6. Then your answer will be less than £6 × 11; that is, LESS THAN £66.
The answer therefore lies between £60 10s. 0d. and £66. An approximate answer would be £63.
   By multiplying, you will find the correct answer is £62 9s. 5d.

1. Write down approximate answers to the following sums; then test your results by working in full:
   (a) £3 1s. 5d. × 10   (b) £6 19s. 9d. × 11   (c) £2 4s. 10d. × 16
   (d) £4 9s. 10d. × 12   (e) £1 0s. 11d. × 20   (f) £4 9s. 10d. × 25

The Nearest Unit

If you were asked to write 57 correct to its nearest ten, your answer would be 60, because 57 is nearer in value to 60 (six tens) than to any other number of tens. If you were asked to write 437 correct to its nearest hundred, your answer would be 400.

> If the answer to a sum is £5 17s. 4¾d., it can be given in any of the following ways :
>   (a) £5 17s. 5d. (correct to the nearest penny)
>   (b) £5 17s. 6d. (correct to the nearest sixpence)
>   (c) £5 17s. (correct to the nearest shilling)
>   (d) £6 (correct to the nearest pound)

2. Write the following numbers correct to the nearest ten:
   (a) 23   (b) 46   (c) 78   (d) 34   (e) 89   (f) 99

3. Write the following numbers: (i) correct to the nearest thousand, (ii) correct to the nearest hundred, and (iii) correct to the nearest ten. *There will be three answers to each.*
   (a) 2,358   (b) 5,724   (c) 8,816   (d) 6,193

4. Write each of the following: (i) correct to the nearest penny, (ii) correct to the nearest sixpence, (iii) correct to the nearest shilling, and (iv) correct to the nearest pound. *There will be four answers to each.*
   (a) £5 16s. 2¾d.   (b) £3 12s. 7¼d.   (c) £17 9s. 5¼d.

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VIII. MEASURING AND WEIGHING

EXERCISE 23. WEIGHTS AND MEASURES

> 7 yd. 2 ft. 10 in. = 23 ft. 10 in. = 286 in.
> 336 qr. = 84 cwt. = 4 tons 4 cwt.

Change:

1. 3 yd. 1 ft. 7 in. to inches.
2. 366 inches to yd. ft.
3. 1 ml. 3 fur. 7 chn. to chains.
4. 1 st. 13 lb. to half-pounds.
5. 1 cwt. 3 qr. to pounds.
6. 306 pints to gal. qt.
7. 1 ton 15 cwt. to quarter-hundredweights.
8. 5 lb. $10\frac{1}{2}$ oz. to half-ounces.

In the following sums, find how many times the smaller quantity is contained in the larger quantity. (See EXERCISE 14.)

9. 30 hours; 45 minutes.
10. $2\frac{1}{2}$ qt.; 10 gallons.
11. 2 ft. 7 in.; $15\frac{1}{2}$ ft.
12. $10\frac{1}{2}$ lb.; $1\frac{1}{2}$ cwt.

In the following sums, give first an approximate, or rough, answer.

13. 1 st. $10\frac{1}{2}$ lb. × 8. Give the answer in stones.
14. 6 cwt. 2 qr. × 12. Give the answer in tons and cwt.
15. 2 cwt. 1 qr. × 23. Give the answer in tons and cwt. to the nearest cwt.
16. 1 ton 12 cwt. 3 qr. × 19. Give the answer to the nearest ton.
17. 2 ft. $10\frac{1}{2}$ in. × 18. Give the answer in yd. ft. in.
18. 3 qt. 1 pt. × 31. Give the answer to the nearest gal.

Work the following:

19. 93 gallons ÷ 8. Give the answer in gal. qt. pt.
20. 5 yd. 1 ft. 4 in. ÷ 7. Give the answer in ft. in.
21. 17 lb. 3 oz. ÷ 5. Give the answer in lb. oz.
22. 5 yd. 2 ft. 5 in. ÷ 13. Give the answer in ft. in. What is the remainder?

EXERCISE 24. PROBLEMS

1. The petrol tank of a lorry holds 11 gallons. If it is empty, find the cost of filling it, when petrol is 2/1½ a gallon.

2. What is the total cost of travelling for a year at 5½d. a day? Omit 52 Sundays and 21 other days for holiday.

3. A grocer buys a hundredweight tub of butter for £8 10s. 8d. He sells this butter at 1/7½ a pound. What profit does he make?

4. 3 cwt. 84 lb. of sugar were bought for £7 18s. 9d. and sold at 5d. per lb. What is the profit?

5. (a) What length of netting will be required to fence the sides of a fowl pen if it is 15 feet wide and 15 yards long? Answer in yards.
   (b) How much will this netting cost at 9½d. a yard?

6. A picture-frame is 2 feet long and 18 inches wide. What will it cost at 3½d. a foot?

7. (a) Plums are packed 12 pounds to the box. What is the total weight, in cwt., of 140 boxes?
   (b) What is the value of these plums at 15/7½ a box?

8. A woman, who uses an oil cooker, stores the oil in a drum which holds 20 gallons. How long will a full drum last if she uses 2 gal. 2 qt. of oil each week?

9. The milkman leaves 2 pints of milk at my house every day. If the milk is sold at 5d. a pint, how much is my milk bill for January?

10. How many times will a cyclist have to go round a track of 275 yards to travel 10 miles?

11. (a) The Tay Bridge is 10,500 feet in length. Give this in miles and yards.
    (b) How many yards is it short of 2 miles?

12. A street, 130 yards long, has houses on each side. If each house has a frontage of 26 feet, how many houses are there in the street?

13. An extension ladder consists of two ladders each 14 ft. 8 in. long. What would be the total length of the extension ladder if the two parts had an overlap of 2 ft. 4 in.?

14. A street has 36 semi-detached houses. If each house has a frontage of 24 ft. and at the side of each house there is a space 10½ ft. wide for a garage, what is the total length of the street? (See illustration on page 22).

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IX. AREA

SOMETHING TO READ: THE RIGHT-ANGLE

Have you ever watched the bricklayer at work? He takes great care to see that the bricks are laid **level** and that the wall is **upright**, or **plumb**. To test his work, he uses two important tools, the **spirit-level** and the **plumb-line**.

SPIRIT-
LEVEL

PLUMB-
LINE

LEARN
    A LEVEL line is called a HORIZONTAL line.
    An UPRIGHT line is called a VERTICAL line.

Place your pencil on the desk in a **horizontal** position. Hold the unsharpened end and turn the pencil until it is in a **vertical** position. We say that the pencil has been turned through a **right-angle**.

Pencil has been
turned through a
RIGHT ANGLE

Horizontal Position

Vertical Position
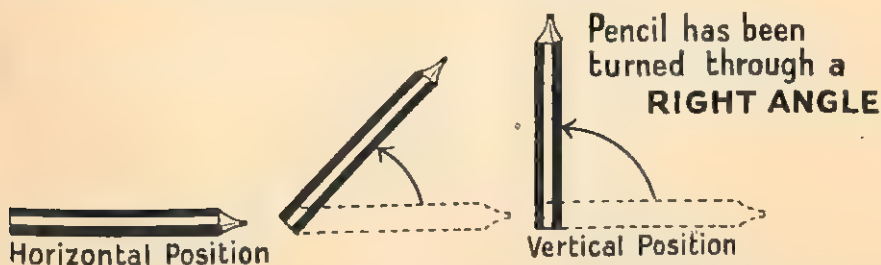
If you continue to turn the pencil until it is again in a horizontal position, then you have turned it through two right-angles.

Pencil has been
turned through two
RIGHT ANGLES
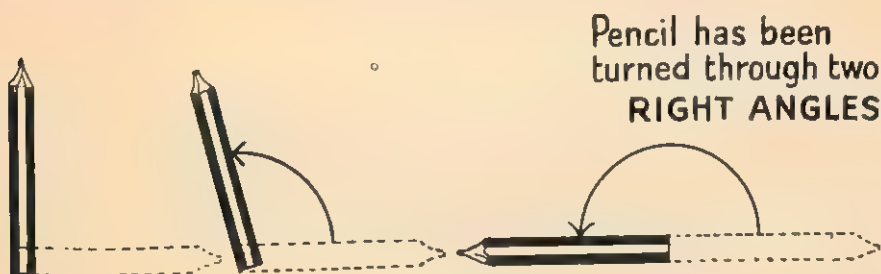
The minute-hand of a clock makes a complete circle in an hour. From the diagrams below, you will see that it turns through *four* right-angles.

| The minute hand has turned through	ONE	TWO	THREE	FOUR

RIGHT ANGLES

LEARN
    A RIGHT-ANGLE is a quarter of a circle; that is, a quarter of a complete turn.

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EXERCISE 25. DRAWING RECTANGLES

1. Draw a line, AB, 3 inches long.   Now place your ruler and set-square as shown in the diagram below, and draw a thin line along the edge, AD, of the set-square.   Slide your set-square along the ruler and draw a thin line along the edge, BC, of the set-square.

Make both AD and BC 2 inches long, and draw a line CD.
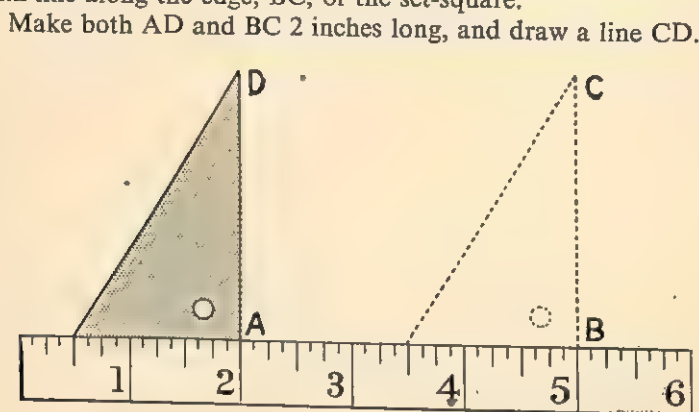
The figure you have drawn is known as a rectangle.

(a) How many sides has a rectangle?
(b) How many angles has a rectangle?
(c) What is the size of each angle in a rectangle?
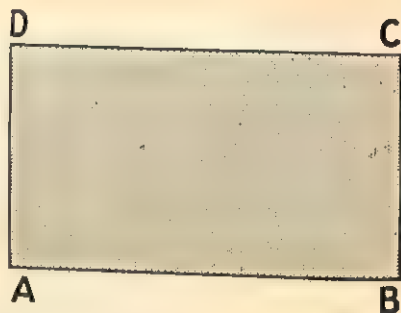
2. Draw a rectangle 3½ inches long and 2½ inches wide.

3. Draw a rectangle having each of its sides 1 inch long.

4. Draw a rectangle having each of its sides 2 inches long.

A rectangle having its four sides equal in length is called a SQUARE.   The square drawn in Question 3 is an inch square ; the square drawn in Question 4 is a two-inch square.
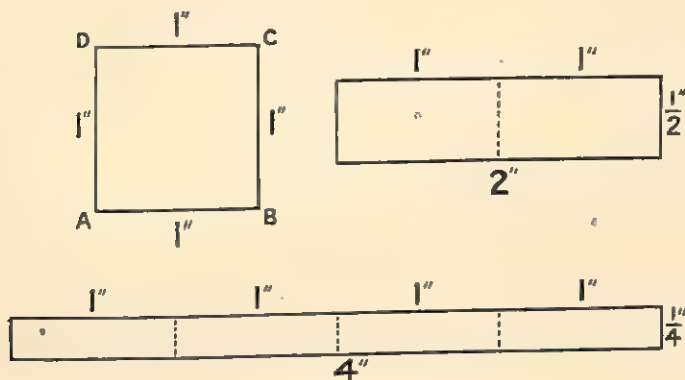

LEARN

A RECTANGLE is a four-sided figure with all its angles right-angles.

A SQUARE is a rectangle with all its sides equal.

The PERIMETER of any figure is the total length of its sides.

EXERCISE 26. THE SQUARE-INCH

1. On a piece of paper draw the rectangles shown below.

(a) What is the total distance round the square from A to B, B to C, C to D, and back to A?

(b) What is the perimeter of each of the other rectangles?

(c) If these three rectangles were pieces of chocolate of the same thickness, which would you consider to be the largest?

(Before answering this question, cut along the dotted lines and place the parts on the square. Is this what you expected?)

When any figure has the same size or surface as a one-inch square it is said to have an AREA of 1 SQUARE-INCH. It does not matter what its shape is, if it covers the same amount of surface. Each of the figures in Question 1 has an area of 1 square-inch.

2. Look at the squares you have drawn in Questions 3 and 4 (Exercise 25). How many times is the surface of the two-inch square larger than the surface of the one-inch square?

This two-inch square is said to have an area of 4 square-inches.

3. Draw a square having each of its sides 3 inches in length. Mark off the sides in inches and draw lines across the square, as shown in the diagram.

(a) What is the area of this 3-inch square?

(b) What is the area of a 5-inch square?

EXERCISE 27. PRIVATE SHOPPING MARKS

When looking into a shop window, you often see that letters have been written on many of the tickets fastened to the articles offered for sale. Have you ever wondered what these letters meant? They are the private, or secret, marks used in the shop, and each letter represents a figure. But only the shopkeeper and his assistants know for what figure each of the letters stands.

For example, the first ten letters of the alphabet may be used to represent the figures 1 to 0:

a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*
1	2	3	4	5	6	7	8	9	0
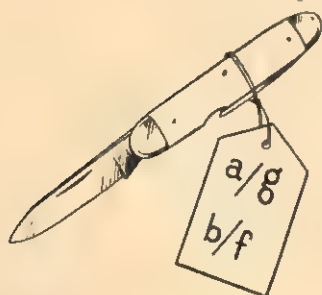
In this case, the *a/g* and *b/f* on the ticket fastened to the knife would represent 1/7 and 2/6; 2/6 is the selling price of the knife; 1/7 is probably the amount the shopkeeper gave for it.

1. Using the letters and figures given on the opposite page, answer the following questions:

   (a) What is the price of an article marked a/c?
   (b) What is the price of a doll marked d/i?
   (c) A small steam-engine is to be sold for 8/6. What letters would be used on the price-ticket?
   (d) What would you mark on the price-ticket of a ball to be sold at 3/9?
   (e) A shopkeeper decided that he would sell a model train for 9/–. What letters would he mark on the price-ticket?

2. The ten letters, with their corresponding figures, form the **code.** Any ten letters could be used in this manner.

   Using the code below, answer the following questions:

b	d	f	h	j	m	p	r	s	t
1	2	3	4	5	6	7	8	9	0

   (a) What are the actual prices of goods marked as follows?

   b/p, h/t, m/m, s/d, f/f, t/h, j/r, d/p, h/r, f/m.

   (b) What letters would be used on the price-tickets of articles to be sold at the following prices?

   3/4, 7/6, 8/2, 7/1, 4/5, 2/6, 7/8, 6/9, 8/1, 9/–.

   (c) A lady went into a shop and bought two presents, one of which was marked j/t, and the other f/r. How much did she pay for these articles?
   (d) A man bought a pipe for 3/6, and a cigarette case for 9/3. What letters were used on each of the price-tickets?
   (e) What is the total cost of articles marked: m/p, t/p, t/b, s/t?

USING A
PLUMB-LINE
AND
SPIRIT LEVEL
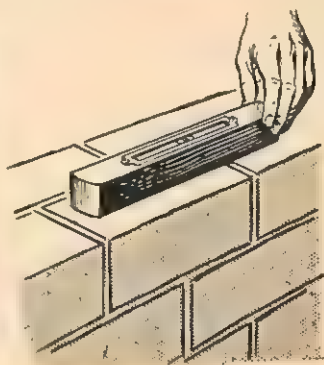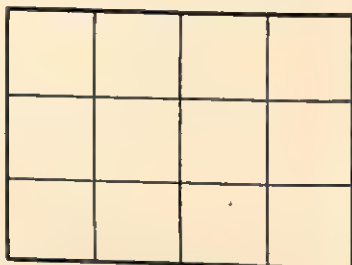
EXERCISE 28. THE AREA OF THE RECTANGLE

> **LEARN**
> A SQUARE-INCH is a surface, or area, equal to the surface, or area, of an inch-square.

1. Draw a rectangle 4 inches long and 3 inches wide. Divide this rectangle into inch squares, as shown.

    (a) How many rows of squares are there?

    (b) How many squares are there in the bottom row?

    (c) How many square-inches are there in this rectangle?

    (d) What is the perimeter of this rectangle?

2. Draw a rectangle 5 inches long and 2 inches wide. Divide the rectangle into inch squares.

    (a) How many squares are there in the bottom row?

    (b) How many rows of squares are there?

    (c) What is the area of this rectangle? Is it larger or smaller than the rectangle in Question 1?

    (d) What is the perimeter of this rectangle? Compare your answer with that found in Question 1 (d).

3. Draw a rectangle $4\frac{1}{2}$ inches long and 3 inches wide. Divide this rectangle into inch squares.

    (a) How many *complete* squares are there in the bottom row?

    (b) What is the size of the smallest rectangle in the bottom row?

    (c) How many square-inches are there in the bottom row?

    (d) What is the area of the rectangle?

Figures 1, 2, and 3 are the same size; each has an area of one square-inch. Figure 1 is also an inch square.
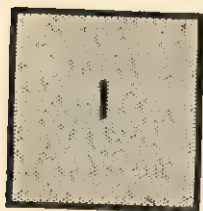
54

**4.** Draw a rectangle 4 inches long and $3\frac{1}{2}$ inches wide, and divide it into inch squares.

    (*a*) How many squares are there in the bottom row?

    (*b*) How many rows of *complete* squares are there?

    (*c*) What is the size of each of the small rectangles in the top row?

    (*d*) What is the area of the rectangle?

From the above examples, you will see that we can find the *number* of square-inches in a rectangle ; that is, we can find its AREA, by multiplying the *number* of inches in its length by the *number* of inches in its width.

If a rectangle is *l* inches long and *b* inches wide, then its area is

    $l \times b$ square-inches.

    $l \times b$ is written as *lb*.

$$\text{Area} = \ell \times b \text{ square inches}$$
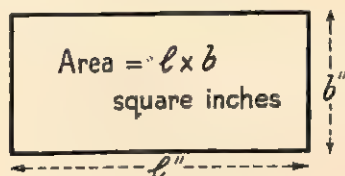
LEARN

    Area of Rectangle $= l \times b$

or

$$A = lb.$$

Find the area of a rectangle 12 inches long and $5\frac{1}{2}$ inches high.

$$A = lb = 12 \times 5\frac{1}{2} = 66$$

$$\text{Area} = 66 \text{ sq. in.}$$

---

5. Find the area of each of the following rectangles:

    (*a*) Length, 7″; breadth, 4″.   (*b*) Length, 11″; breadth, 5″.

    (*c*) Length, $8\frac{1}{2}$″; breadth, 4″.   (*d*) Length, 12″; breadth, $4\frac{1}{2}$″.

6. Drawing papers have special names according to their sizes.

    (*a*) From the measurements in the table, find the area of each size.

    (*b*) Now write a list of their names in order, placing the largest size of paper first.

Name of Paper Size	Length	Width	Name of Paper Size	Length	Width
Imperial	30″	22″	Cartridge	26″	21″
Elephant	28″	23″	Royal.........	24″	19″
Super Royal ...	27″	19″	Double Demy ..	31″	20″
Emperor	72″	48″	Atlas	34″	26″
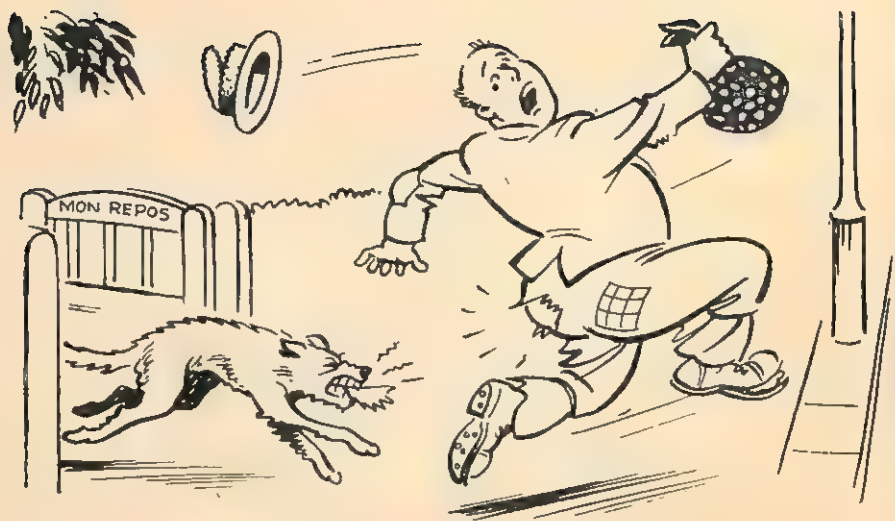
X. REVISION

EXERCISE 29. LOOKING BACKWARDS

First Glance

1. How many pencils are there in 36 gross?

2. A book of 160 pages contains 56,000 words. What is the average number of words on each page?

3. What is the cost of 37 yards of material at 4s. 11¾d. a yard?
Find an approximate, or rough, answer first.

4. Omitting the cost of his railway tickets, a man found that his summer holiday had cost him £10 5s. 10d. He was on holiday for 13 days. What was the average daily cost of the holiday?

Second Glance

1. What is the total weight of 29 planks of wood, if the weight of each plank is 2 qr. 17 lb.? Find an approximate, or rough, answer first.

2. (a) To make a garden fence 224 strips of wood, each 20 in. long, were used. What was the total length of this wood, to the nearest foot?
   (b) How many feet had to be bought to make this fence?

3. (a) How many skipping ropes, each 5 ft. 6 in. long, could be made from 4 dozen yards of rope?
   (b) If this supply of rope were cut to make 27 skipping ropes, what would be the length of each?

4. How many pieces of wood, 1 ft. 2½ in. long, could a carpenter cut from a plank 7 ft. 3 in. in length?

Third Glance

1. How many times is 12s. 6d. contained in £49 7s. 6d.?

2. How many yards of serge, at 13s. 6d. a yard, can be bought for 9 guineas?

3. (a) What is the area of the top surface of the paper shown in the picture?
   (b) What is the perimeter of this surface?
   (c) If the folded sheet is opened, what will be the area of the top surface of the double sheet?
   (d) What will be the perimeter of this double sheet?

4. (a) What is the area of a drawing board 31 inches long and 23 inches wide?
   (b) What is the perimeter of this board? *Give your answer in feet.*
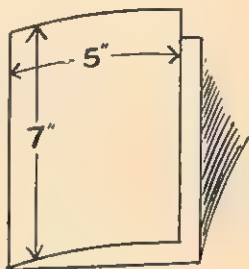
USING
A
T-SQUARE

EXERCISE 30. MECHANICAL SUMS

Set A. Addition and Subtraction

1.				2.	£	s.	d.		3. tons	cwt.	qr.		4. yd.	ft.	in.
	5,723				15	0	3		15	12	1		10	0	7
	2,908				2	17	10½		9	16	3		2	2	11½
	5,117				5	16	5¾		6	10	1		3	1	8
	293				2	10	7½		5	9	2		5	2	6¾
	2,065				9	12	9½		7	17	2		1	2	5½
	1,496														

5–8. Take the second line from the first line in each of the above sums. Check each answer.

Set B. Multiplication and Division

1. 1,037 × 76

2. 5 yd. 2 ft. 3 in. × 26

3. £3 12s. 5½d. × 5

4. 3 cwt. 1 qr. 3 lb. × 19

5. £3 12s. 7½d. × 39

6. 5 gal. 2 qt. 1 pt. × 53

7. 3 lb. 9 oz. × 8

8. 59,328 ÷ 72

9. 5 ml. 2 fur. 3 chn. × 6

10. £39 13s. 8d. ÷ 5.   (Answer in £ s. d.   What is the remainder?)

11. £463 10s. ÷ 31.   (Answer in £ s. d.   What is the remainder?)

12. 6 fur. 7 chn. 15 yd. ÷ 8.   (Answer correct to the nearest yard.)

13. 15 ml. 3 fur. 6 chn. ÷ 17.   (Answer in fur. and chn.   What is the remainder?)

14. 15 cwt. 3 qr. ÷ 14.   (Answer in cwt. and lb.)

15. 300 tons ÷ 29.   (Answer in tons and cwt., correct to the nearest cwt.)

Set C. Reduction

Change:

1. 3 yd. 2 ft. 7 in. to inches

2. 1,528 yards to chn. yd.

3. 3 ml. 5 fur. to chains

4. 306 chains to ml. fur. chn.

5. 3 ml. 3 fur. to yards

6. 732 pints to gal. qt.

7. 9 st. 10 lb. to pounds

8. 1,008 ounces to lb.

9. 24½ hours to minutes

10. 9,072 pounds to tons and cwt.

11. 392 inches to yd. ft. in.

12. 1,400 minutes to hr. min.

13. How many times is 3s. 6d. contained in £6 13s.?

14. How many times is 14/– contained in 8 guineas?

15. How many times is 3 gal. 2 qt. contained in 63 gal.?

16. How many times is 3 st. 10 lb. contained in 13 cwt.?

17. How many times is 2 ft. 9 in. contained in 110 ft.?

XI.   THE POST OFFICE

SOMETHING TO READ: THE STORY OF THE POST OFFICE

We do not know when letters were first sent across the country from one part to another.   But from very early times, during periods of war, messages were carried great distances by horsemen.   During a war in Scotland in 1480, horses were kept at places 20 miles apart, and messages could be sent 100 miles in a day.   In 1657, the Government decided to take complete charge of these mounted postmen, and a law was passed that " there shall be but one post office and one post-master-general to settle post."   But, during the eighteenth century, robberies by highwaymen were so frequent that, from 1784, letters were sent by mail-coaches carrying armed men to guard them.   At this time, the postal rate depended on the weight of the letter and on the distance it had to be carried.   To send a letter (of one sheet of paper) a distance of 15 miles cost 4d.   The cost of sending a letter from London to Durham was 1/-.   The postage was not paid by the sender of the letter but by the person who received it.   Quite often people sent empty envelopes to each other to show that all was well—the envelopes were refused at the door to avoid paying the postage!

The Post Office, as we know it to-day, however, is only about 100 years old.

In the early days of the reign of Queen Victoria, **Rowland Hill** suggested that the cost of sending letters should be reduced.   In 1840, he introduced what was known as the **Penny Post** whereby a letter weighing not more than $\frac{1}{2}$ oz. could be carried any distance for one penny.

EXERCISE 31. LETTER AND PARCEL POST

```
POSTAL RATES—INLAND
Not exceeding 2 oz.........................2½d.
Each additional 2 oz. or fraction of 2 oz.....  ½d.
Postcards ...........................2d.
```

1. Find the cost of posting:
   - (a) 18,   (b) 38,
   - (c) 198, (d) 358 postcards.

2. What will it cost to post:
   - (a) 26,   (b) 50,   (c) 110,
   - (d) 258 letters if each weighs less than 2 oz.?

3. Find the cost of posting:
   - (a) 7 letters and 7 postcards,
   - (b) 19 letters and 9 postcards,
   - (c) 28 letters and 15 postcards, if each letter weighs less than 2 oz.

4. What will it cost to send letters having the following weights?
   - (a) 1 oz.   (b) 2½ oz.   (c) 5 oz.
   - (d) 6 oz.   (e) 7 oz.   (f) 8 oz.

5. What is the greatest weight which a package, sent by letter post, may have if stamped for:
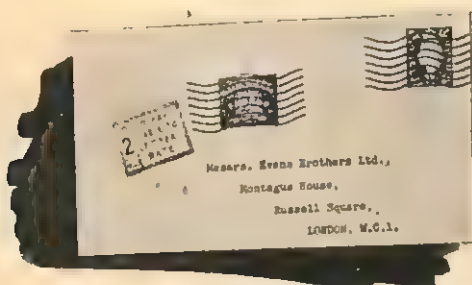   - (a) 3½d.   (b) 5d.   (c) 6d.?

```
             PARCEL RATES—INLAND
Up to 3 lb. ..............  9d.      6 to 7 lb.  ..............  1/2
  3 to 4 lb. ..............  11d.      7 to 8 lb.  ..............  1/3
  4 to 5 lb. ..............  1/-.      8 to 15 lb. ..............  1/4
  5 to 6 lb. ..............  1/1       LIMIT—15 lb.
```

6. What will it cost to send parcels having the following weights?
   - (a) 2 lb. (b) 3 lb.   (c) 3½ lb. (d) 7 lb. (e) 7½ lb.
   - (f) 8 lb. (g) 10 lb. (h) 11 lb. (i) 15 lb.

7. (a) What will it cost to send a parcel weighing 1¼ lb.?
   (b) What will it cost to send this parcel as a letter?

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8. (*a*) What will it cost to send a parcel weighing $1\frac{3}{4}$ lb.?

(*b*) What will it cost to send this parcel as a letter?

9. I wish to send an article weighing 12 oz. by post. Will it be cheaper for me to send it as a parcel, or as a letter?

10. (*a*) Two parcels, addressed to the same person, are weighed at the Post Office. One is found to weigh $2\frac{1}{2}$ lb. and the other $3\frac{1}{2}$ lb. What is the postage on each parcel? What is the total cost of postage?

(*b*) What would be the total weight if these two parcels were made into one large package?

(*c*) What would the postage be on this larger parcel?

(*d*) What could be saved in postage by sending them as one parcel?

11. Two parcels, one weighing 4 lb. 6 oz. and the other $3\frac{1}{2}$ lb., were posted to the same man on the same day.

(*a*) What was the total postage on these parcels?

(*b*) What could have been saved in postage if the articles had been packed together and sent as one parcel?

When a letter is not sufficiently stamped, the Post Office makes an extra charge, called a **surcharge**, and uses " Postage Due " stamps. This **surcharge** is paid by the receiver before the letter is handed over to him and is equal to twice the amount that the postage is short.

For example, a letter weighing 5 oz. requires a $3\frac{1}{2}d.$ stamp. If this letter is stamped with a $2\frac{1}{2}d.$ stamp there is a shortage of $1d.$; and the surcharge will be $2d.$

12. (*a*) What is the correct postage for a letter weighing 7 oz.?

(*b*) This letter was posted with a $2d.$ stamp. What is the shortage of postage?

(*c*) What would be the surcharge on this letter?

13. Find the surcharge on each of the following letters:

(*a*) Weight, 10 oz.; stamped for $3d.$

(*b*) Weight, 6 oz.; stamped for $2\frac{1}{2}d.$

(*c*) Weight, $8\frac{1}{2}$ oz.; stamped for $2\frac{1}{2}d.$

EXERCISE 32. STAMP MACHINES

1. A newly filled stamp machine contains 3,840 stamps, half of which are penny stamps.

   (a) How many penny, and how many halfpenny, stamps are in this machine?

   (b) What is the value of the penny stamps?

   (c) What is the value of the halfpenny stamps?

2. During a certain week it was found that 900 penny and 850 halfpenny stamps were sold from a newly filled machine.

   (a) How many penny stamps were left?

   (b) How many halfpenny stamps were left?

   (c) What will be the amount collected in pence?

   (d) How much will be collected in halfpence?

   (e) What is the total amount collected from this machine?

3. (a) On a certain Sunday, 180 penny stamps and 168 halfpenny stamps were sold from a stamp machine. How much money was collected in pence? How much was collected in halfpence? What was the total amount collected during the day?

   (b) On the following Monday, 8/- was collected in pence and 3/- in halfpence. How many penny stamps were sold on this day? How many halfpenny stamps were sold?

   (c) Make a copy of the table below and complete all columns as shown for Saturday.

   (d) Add the total of column (b) to the total of column (d). Is your result equal to the total of column (e)?

DAYS OF WEEK	1ᴰ Stamps		½ᴰ Stamps		
	NUMBER (a)	AMOUNT (b)	NUMBER (c)	AMOUNT (d)	TOTAL AMOUNT (e)
SUNDAY	180		168		
MONDAY		8/-		3/-	
TUESDAY	108			5/-	
WEDNESDAY		13/-	144		
THURSDAY		7/6		3/6	
FRIDAY	123		114		
SATURDAY	112	9/4	112	4/8	14/-
TOTALS					

EXERCISE 33. TOO BIG OR TOO HEAVY

1. Look at this drawing of a parcel.
   - (a) What is the length from A to B?
   - (b) What is the length from B to C?
   - (c) What is the total length from A to B, B to C, around the parcel, and back to A? (The distance round a parcel is known as the **girth.**)
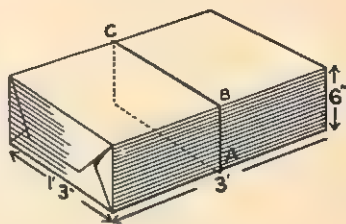
2. What is the girth of a parcel 15 inches wide and 8 inches deep?

3. (a) What is the length of the parcel in Question 1?
   (b) What is the sum of the length and girth of this parcel?

   The Post Office would not send this parcel by post because its length and girth together are more than 6 feet. They will also refuse to take a parcel if its length is more than 3 feet 6 inches.

4. Look at this drawing of a parcel.
   - (a) What is the length of this parcel?
   - (b) What is the girth of this parcel?
   - (c) What is the sum of the length and girth?
   - (d) Could this parcel be sent by post?
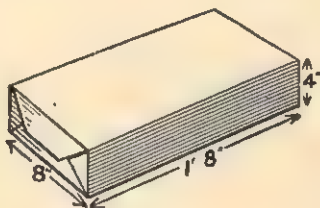
5. A parcel is 16″ wide and 8″ deep. What is the greatest length that this parcel may have in order that it can be sent by parcel post?

6. Would the Postmaster refuse to take a parcel which was 4 feet in length?

7. What is the greatest weight of a parcel that can be sent by post? (See Parcel Rates in Exercise 31.)

8. Give reasons why the Postmaster would refuse to take these parcels :

No 1 - 4 lb.

No 2 - 7½ lb.

No 3 - 16¼ lb.
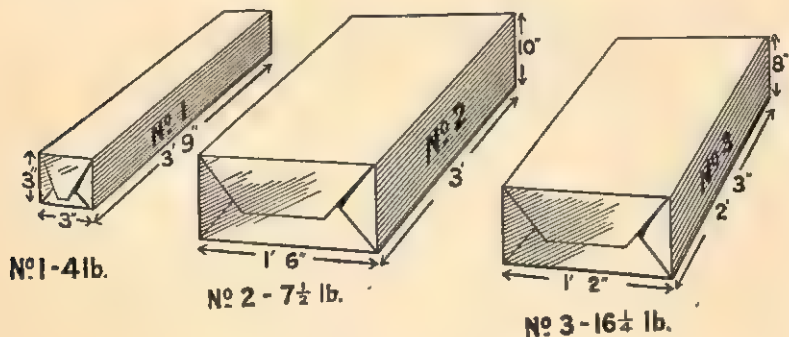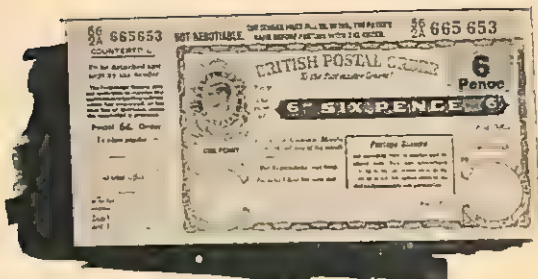
(*Reproduced by permission of H.M. Postmaster General*)

EXERCISE 34. POSTAL ORDERS

The best way to send small amounts of money through the post is by means of the **Postal Order.**

These Postal Orders may be obtained for any value from 6*d.* to 5/– at intervals of 6*d.*; and from 6/– to 21/– at intervals of a shilling; that is, for 6*d.*, 1/–, 1/6, 2/–, 2/6, etc., up to 5/– and then for 6/–, 7/–, 8/–, etc. up to 21/–. To make up any odd amount, stamps may be fixed in the lower right-hand corner of the Order.

1. (*a*) What price Postal Order would you buy to send 2/8 through the post?
   (*b*) What would be the value of the stamps you would fix to the Order?

2. (*a*) What price Postal Order would you buy to send 12/8 through the post?
   (*b*) What would be the value of the stamps you would fix to the Order?

3. I wish to send the following amounts through the post. Find (i) the value of the Postal Order needed, and (ii) the value of the stamps to be fixed to the Order.

   (*a*) 6/7   (*b*) 3/9   (*c*) 10/8   (*d*) 7/11   (*e*) 5/4

When buying a Postal Order you will find that the Post Office makes an extra charge known as **poundage** which depends on the value of the Order as shown in the table.

From this table, you will see that a 6*d.* Postal Order costs 7*d.* (6*d.* + 1*d.* poundage); a 1/– Order costs 1/1 ; a 3/– Order costs 3/1½; a 15/– Order costs 15/2; and so on.

Value	Poundage
6*d.* to 1/–	1*d.*
1/6 to 5/–	1½*d.*
6/– to 21/–	2*d.*

4. What poundage would you have to pay on Postal Orders for:
   (*a*) 2/6   (*b*) 4/6   (*c*) 12/–   (*d*) 17/–   (*e*) 19/–?

5. What is the total cost of each of the Postal Orders named in the last question?

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6. I wish to send 9/10 by Postal Order.

    (*a*) What is the value of the Order which I shall have to buy?

    (*b*) What is the poundage on this Order?

    (*c*) What is the value of the stamps I should fix to the Order?

    (*d*) What is the total cost of a Postal Order to the value of 9/10?

7. What is the total cost of Postal Orders having the following values:

    (*a*) 3/11   (*b*) 5/7   (*c*) 18/3   (*d*) 20/5   (*e*) 1/5?

8. If I give an assistant in a Post Office a 10/– note to pay for a Postal Order for 7/10, what change shall I receive?

9. A girl decides to send for an article advertised in the paper at 6/11, post free. How much will this article really cost her? (Include the poundage and the cost of postage of her letter.)

10. A boy sent a Postal Order to a firm for a book which was advertised at 5/–, plus 9*d*. postage.

    (*a*) What must be the total value of the Postal Order?

    (*b*) What will be the cost of this Order?

    (*c*) How much did the book actually cost him? (Include postage.)

11. A wireless-pole is advertised at 19/6, plus carriage 1/–. If you sent for this by letter, what would be the total cost including poundage and postage?

12. (*a*) What is the total cost of two 12/6 Postal Orders?

    (*b*) What is the total cost of two Postal Orders, one for 20/– and one for 5/–?

    (*c*) If you wished to send 25/– by letter, would you buy two 12/6 Postal Orders, or one for 20/– and another for 5/–?

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EXERCISE 35. TELEGRAMS
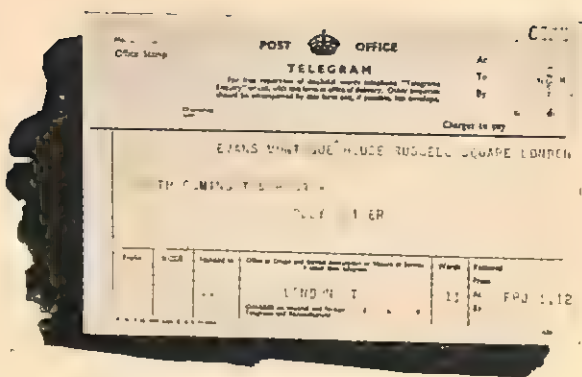
The cost of sending a telegram to any place in Great Britain is one shilling for the first nine words and one penny for each word over nine. Here is an example:

Evans	Montague	House	Russell	Square	London
1	2	3	4	5	6
Both	coming	tomorrow	Polly	Oliver	
7	8	9	10	11	

There are eleven words in this telegram; the charge, therefore, would be 1/2 (1/– for nine words, and 2d. for two additional words).

If the words *Both* and *Polly* were omitted, there would have been nine words, for which the charge would have been 1/–.

1. Find the number of words in, and the charge for, the following telegrams:
   (a) Catchem Police Station Brighton Returning noon Saturday Robert.
   (b) Lamb Butcher High Street Silvertown Garage being sent Monday by rail Wood.
   (c) Scrooge Marley House London Merry Christmas God bless you Bob Cratchit.
   (d) Oates Grazefield Farm Cowley Order received Corn will be sent immediately Miller instructed yesterday Wheatley.

2. (a) Find the cost of sending the following telegram:
   Brown Secondary School Redstone *Please* send passports *by* return *of* post *The* agents need them *by* Thursday Jones.
   (b) How much would it cost to send this telegram, omitting the words in italics?

XII. VULGAR FRACTIONS

EXERCISE 36. EQUAL FRACTIONS

Look carefully at the rectangles below. You will see that they are exactly the same size. The first has been divided into *two equal parts*. The second into *four equal parts*. The third into *eight equal parts*, and the fourth into *sixteen equal parts*.


Halves
Quarters or Fourths
Eighths
Sixteenths
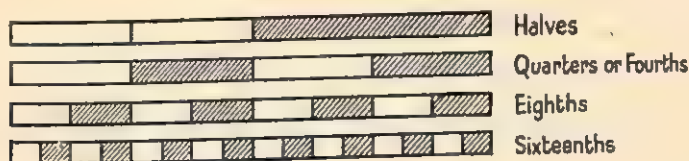
Be ready to answer these questions:

(a) How many quarters, or fourths, are equal to a half?
(b) How many eighths are equal to a half?
(c) How many sixteenths are equal to a half?
(d) Which is the larger, three-quarters or six-eighths?
(e) What is the value of a quarter of a shilling?
(f) What is the value of an eighth of a shilling?
(g) What is the value of three-quarters of a shilling?
(h) What is the value of six-eighths of a shilling?

Look at these rectangles, and be ready to answer the questions below:

(a) Into how many equal parts is the first rectangle divided?
(b) What is the name of each of these parts?
(c) Into how many equal parts is the second rectangle divided?
(d) What is the name of each of these parts?
(e) How many sixths are there in two-thirds of the rectangle?
(f) If a rectangle is divided into fifteen equal parts, what is the name of each part?
(g) How many of these parts are there in a third of the rectangle?
(h) How many fifteenths are there in two-thirds of the rectangle?
(i) What is the value of a fifteenth of a half-crown?
(j) What is the value of ten-fifteenths of a half-crown?
(k) What is the value of two-thirds of a half-crown?

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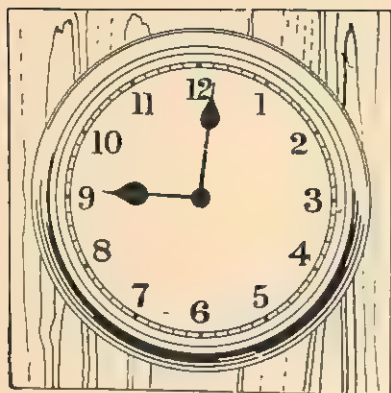
The divisions on the circle of the clock-face show the hours and the minutes. Look at the drawing and be ready to answer these questions:

(a) Into how many equal parts is the circle divided by the hour-marks?

(b) What is the name of each part?

(c) Into how many equal parts is the circle divided by the minute-marks?

(d) What is the name of each part?

(e) How many twelfths are there in a quarter of the circle?

(f) How many sixtieths are there in a twelfth of the circle?

(g) How many sixtieths are there in a quarter of the circle?

A Fraction is a part of something. When writing a fraction, two numbers are used. These are placed one above the other and are separated by a horizontal line.

One third is written as $\frac{1}{3}$; three-fourths as $\frac{3}{4}$.

The lower number gives the **name** of the fraction, and is known as the **naming part**, or **denominator**. The upper number gives the **number** of parts, and is called the **numerator**.

LEARN

$$\text{FRACTION} = \frac{\text{NUMERATOR}}{\text{DENOMINATOR}} = \frac{\text{(Number of Parts)}}{\text{(Name of Parts)}}$$

---

1. (a) If a cake is divided into six equal parts, what is the name of each part?

   (b) How many of these parts are there in a half of a cake?

   (c) Copy the following and fill in the numerator of the second fraction:

   $$\frac{1}{2} = \frac{\ast}{6}$$
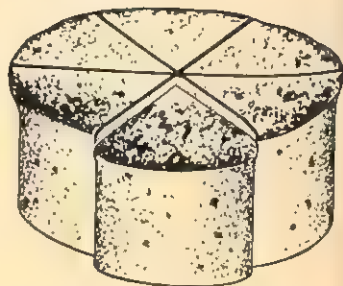
2. Copy the following, and fill in the numerators so that each fraction is equal to one-half ($\frac{1}{2}$). Your ruler will help you.
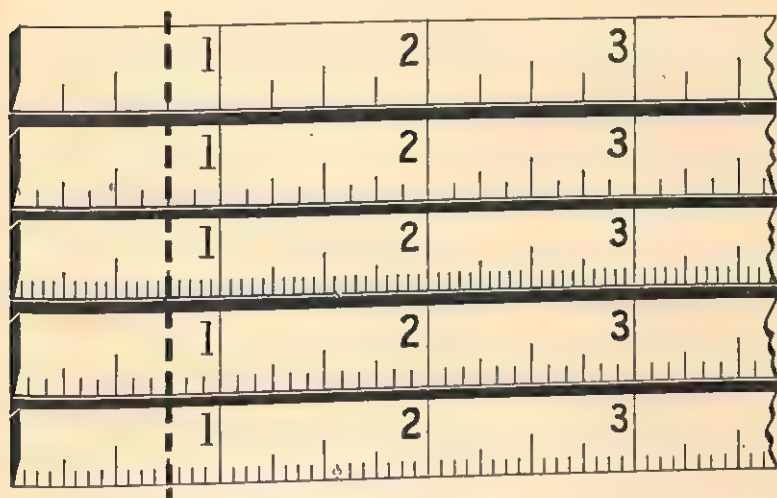
$$\frac{1}{2} = \frac{\ast}{4} = \frac{\ast}{10} = \frac{\ast}{8} = \frac{\ast}{6} = \frac{\ast}{20}$$

3. (*a*) How many twenty-fourths are there in a quarter?

(*b*) How many twenty-fourths are there in three-quarters?

(*c*) Copy the following, and fill in the numerator of the second fraction:

$$\frac{3}{4} = \frac{*}{24}$$

4. Copy the following fractions, and fill in the numerators so that each fraction is equal to three-quarters ($\frac{3}{4}$). Use the diagram below:

$$\frac{3}{4} = \frac{*}{8} = \frac{*}{20} = \frac{*}{12} = \frac{*}{16}$$

LEARN

The value of a fraction is not altered by multiplying, or dividing, the numerator and denominator by the *same* number.

$\frac{5}{6} = \frac{15}{18}$ (Multiplying the numerator and denominator by 3)

$\frac{12}{24} = \frac{1}{2}$ (Dividing the numerator and denominator by 12)

---

5. Copy the following fractions and fill in the missing numerators and denominators:

(*a*) $\frac{3}{4} = \frac{6}{*} = \frac{*}{16} = \frac{15}{*}$ (*b*) $\frac{2}{3} = \frac{*}{9} = \frac{4}{*} = \frac{10}{*}$

$\frac{16}{24} = \frac{8}{12}$ or $\frac{4}{6}$ or $\frac{2}{3}$. By writing $\frac{16}{24}$ as $\frac{2}{3}$, we use the smallest numbers possible; $\frac{16}{24}$ is then in its **lowest terms**. $\frac{15}{20}$ in its lowest terms is $\frac{3}{4}$.

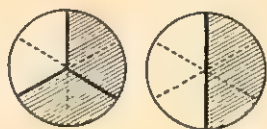**6.** Write the following fractions in their lowest terms:

(*a*) $\frac{6}{8}$ (*b*) $\frac{4}{16}$ (*c*) $\frac{10}{16}$ (*d*) $\frac{24}{32}$ (*e*) $\frac{4}{12}$ (*f*) $\frac{8}{24}$ (*g*) $\frac{10}{24}$

(*h*) $\frac{12}{18}$ (*i*) $\frac{6}{10}$ (*j*) $\frac{8}{16}$ (*k*) $\frac{15}{25}$ (*l*) $\frac{9}{15}$ (*m*) $\frac{72}{96}$ (*n*) $\frac{48}{72}$

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EXERCISE 37. COMPARING FRACTIONS

1. (a) Fill in the missing numerators in
these fractions:
$\frac{2}{3} = \frac{*}{6}$; $\frac{1}{2} = \frac{*}{6}$
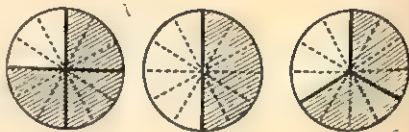   (b) Which is the larger: $\frac{2}{3}$ or $\frac{1}{2}$?

2. (a) Fill in the missing numerators in
the following fractions:
$\frac{3}{4} = \frac{*}{12}$; $\frac{1}{2} = \frac{*}{12}$; $\frac{2}{3} = \frac{*}{12}$
   (b) Which is the largest: $\frac{3}{4}$, $\frac{1}{2}$ or $\frac{2}{3}$?
   (c) Write these fractions in order,
placing the largest first.

3. (a) Copy the following fractions, and fill in the missing numerators
In each case make the fraction in the second row equal to the
fraction just above.

$$\frac{3}{4} \qquad\qquad \frac{4}{5} \qquad\qquad \frac{1}{2}$$

$$\frac{*}{20} \qquad\qquad \frac{*}{20} \qquad\qquad \frac{*}{20}$$

   (b) Write the three fractions, $\frac{3}{4}$, $\frac{4}{5}$, and $\frac{1}{2}$, in order, placing the largest first.

4. (a) Copy the following fractions, and fill in the missing numerators. In
each case make the fraction in the second row equal to the fraction
just above.

$$\frac{5}{6} \qquad\qquad \frac{3}{4} \qquad\qquad \frac{7}{8} \qquad\qquad \frac{2}{3}$$

$$\frac{*}{24} \qquad\qquad \frac{*}{24} \qquad\qquad \frac{*}{24} \qquad\qquad \frac{*}{24}$$

   (b) Write the fractions $\frac{5}{6}$, $\frac{3}{4}$, $\frac{7}{8}$, and $\frac{2}{3}$ in order, placing the smallest fraction
first.

5. In the second line of Questions 3 (a) and 4 (a) the fractions have been
changed to the **same name.** $\frac{3}{4}$, $\frac{4}{5}$ and $\frac{1}{2}$ were all changed to twentieths;
$\frac{5}{6}$, $\frac{3}{4}$, $\frac{7}{8}$, and $\frac{2}{3}$ were all changed to twenty-fourths.
   (a) Change the fractions, $\frac{7}{8}$, $\frac{1}{2}$, and $\frac{1}{4}$, to the same name (*eighths*).
   (b) Change the fractions, $\frac{1}{2}$, $\frac{5}{6}$, and $\frac{2}{3}$, to the same name (*sixths*).
   (c) Change the fractions, $\frac{2}{5}$, $\frac{3}{4}$, $\frac{7}{10}$, and $\frac{1}{2}$, to the same name (*twentieths*).
   (d) Change the fractions, $\frac{3}{4}$, $\frac{1}{2}$, and $\frac{5}{6}$, to the same name.
   (e) Change the fractions, $\frac{1}{6}$, $\frac{3}{4}$, $\frac{5}{8}$, and $\frac{11}{12}$ to the same name.

6. Find the largest and smallest of the following fractions. You must first
change them to the same name.

$$\frac{1}{2} \qquad \frac{5}{8} \qquad \frac{7}{12} \qquad \frac{2}{3} \qquad \frac{5}{6} \qquad \frac{3}{4}$$
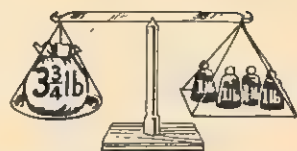
7. Arrange the following fractions in order, placing the largest first:

$$\frac{2}{5} \qquad \frac{3}{8} \qquad \frac{1}{6} \qquad \frac{7}{10} \qquad \frac{1}{4} \qquad \frac{5}{12}$$

EXERCISE 38. MIXED NUMBERS

$3\frac{3}{4}$ pounds is equal to three whole pounds and three-quarters of a pound.

$3\frac{3}{4}$ is a **mixed number**; it contains three whole ones and a fraction.

1. Which of the following are mixed numbers?

$\frac{7}{8}$ $2\frac{3}{4}$ $10\frac{1}{2}$ $\frac{5}{6}$ $7\frac{1}{8}$ $\frac{2}{3}$ $4\frac{5}{8}$

2. By reading from your ruler, change the following into mixed numbers:

(a) $\frac{5}{4}$ (b) $\frac{11}{8}$ (c) $\frac{19}{16}$ (d) $\frac{13}{12}$ (e) $\frac{13}{10}$

3. Write the following as mixed numbers:

(a) $\frac{9}{2}$ (b) $\frac{23}{10}$ (c) $\frac{17}{3}$ (d) $\frac{7}{4}$ (e) $\frac{32}{9}$ (f) $\frac{17}{5}$ (g) $\frac{7}{6}$

A fraction is a part of a whole; $\frac{3}{4}$ (three-quarters) is a fraction, but $\frac{5}{4}$ (five-quarters) is greater than a whole one, and is equal to the mixed number $1\frac{1}{4}$. Therefore, $\frac{5}{4}$ is not a true, or proper, fraction, but is an **improper fraction.**

> **LEARN**
>
> $\frac{3}{4}$ is a **PROPER FRACTION.**
>
> $\frac{5}{4}$ is an **IMPROPER FRACTION.**
>
> $1\frac{1}{4}$ is a **MIXED NUMBER.**

4. (a) Write the following in two lines, placing the proper fractions in one line, and the improper fractions in a second line:

$\frac{3}{4}$ $\frac{17}{8}$ $\frac{17}{20}$ $\frac{18}{5}$ $\frac{4}{5}$ $\frac{29}{8}$ $\frac{31}{12}$ $\frac{7}{8}$ $\frac{11}{12}$

(b) On the third line, write each of the improper fractions as a mixed number.

5. Write the following as improper fractions: $3\frac{1}{4}$ $2\frac{2}{3}$ $1\frac{5}{6}$ $5\frac{5}{8}$ $2\frac{3}{5}$

6. (a) How many $\frac{1}{2}$-lb. packets of tea can be filled from $5\frac{1}{2}$ lb. of tea?

(b) If $5\frac{1}{2}$ lb. of tea cost 19/3, what will a $\frac{1}{2}$-lb. packet cost?

(c) What is the cost of 1 lb. of this tea?

7. (a) How many quarter-yards are there in $1\frac{3}{4}$ yd.?

(b) If $1\frac{3}{4}$ yd. of material cost 9/11, what is the cost of 1 yd.?

8. Find the cost of:

(a) 1 lb. of sugar, when $3\frac{1}{2}$ lb. cost 1/5$\frac{1}{2}$.

(b) 1 ft. of wood, when $10\frac{1}{2}$ ft. cost 7/–.

(c) 1 doz. oranges, when $7\frac{1}{2}$ doz. cost 22/6.

(d) 1 yd. of carpet, when $2\frac{3}{4}$ yd. cost 66/–.

(e) 1 gal. of milk, when $3\frac{1}{4}$ gal. cost 10/10.

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XIII. ADDITION AND SUBTRACTION VULGAR FRACTIONS

EXERCISE 39. ADDITION OF VULGAR FRACTIONS

1. Use your ruler to add these fractions:

(a) $\frac{1}{2} + \frac{1}{4}$ (b) $\frac{1}{2} + \frac{1}{8}$ (c) $\frac{1}{4} + \frac{3}{8}$ (d) $\frac{1}{2} + \frac{3}{8}$

(e) $\frac{1}{2} + \frac{1}{16}$ (f) $\frac{1}{4} + \frac{3}{16}$ (g) $\frac{3}{4} + \frac{1}{16}$ (h) $\frac{1}{2} + \frac{5}{16}$

(i) $\frac{1}{4} + \frac{1}{12}$ (j) $\frac{1}{2} + \frac{1}{12}$ (k) $\frac{1}{4} + \frac{5}{12}$ (l) $\frac{3}{4} + \frac{1}{12}$

2. Copy and fill in the missing numerators in the following sums:

$$\frac{7}{8} + \frac{5}{6} + \frac{1}{2} = \frac{\cdot}{24} + \frac{\cdot}{24} + \frac{\cdot}{24} = \frac{\cdot}{24} = 2\frac{\cdot}{24}$$

Instead of writing the **common denominator** (24) under each fraction, the above sum may be written:

$$\frac{7}{8} + \frac{5}{6} + \frac{1}{2} = \frac{21+20+12}{24} = \frac{53}{24} = 2\frac{5}{24}$$

3. Find the value of:

(a) $\frac{1}{2} + \frac{2}{3}$ (b) $\frac{1}{2} + \frac{3}{5}$ (c) $\frac{2}{3} + \frac{3}{4}$ (d) $\frac{1}{3} + \frac{5}{8}$

(e) $\frac{3}{4} + \frac{2}{5}$ (f) $\frac{1}{2} + \frac{5}{9}$ (g) $\frac{5}{6} + \frac{2}{3} + \frac{1}{2}$ (h) $\frac{5}{8} + \frac{11}{16} + \frac{3}{4}$

(i) $\frac{1}{3} + \frac{5}{9} + \frac{5}{6}$ (j) $\frac{7}{12} + \frac{3}{4} + \frac{2}{3}$ (k) $\frac{1}{2} + \frac{5}{16} + \frac{3}{8}$ (l) $\frac{2}{3} + \frac{5}{6} + \frac{7}{9}$

$$2\frac{7}{8} + \frac{3}{4} + 1\frac{1}{2} = 3\frac{7+6+4}{8} = 3\frac{17}{8} = 5\frac{1}{8}$$

4. Find the value of:

(a) $2\frac{1}{4} + 1\frac{1}{3} + \frac{1}{2}$ (b) $1\frac{3}{4} + 1\frac{3}{8} + 2\frac{1}{2}$ (c) $1\frac{5}{6} + 3\frac{2}{3} + 2\frac{5}{9}$

5. (a) Find the value of $1\frac{1}{2} + 1\frac{3}{4} + 1\frac{1}{4}$.

(b) Draw any straight line.

A   B   C   D

From A, measure AB ($1\frac{1}{2}''$); from B, measure BC ($1\frac{3}{4}''$), and from C, measure CD ($1\frac{1}{4}''$). Find the length of the line from A to D. Does this agree with the answer found in (a)?

6. (a) What is the value of: $1\frac{5}{8} + 1\frac{1}{8} + 2\frac{1}{4}$?

(b) Check your answer by drawing.

EXERCISE 40. SUBTRACTION OF VULGAR FRACTIONS

1. Use your ruler to work the following sums:

   (a) $\frac{1}{2} - \frac{1}{4}$ (b) $\frac{1}{2} - \frac{1}{8}$ (c) $\frac{3}{8} - \frac{1}{4}$ (d) $\frac{7}{8} - \frac{1}{2}$

   (e) $\frac{1}{2} - \frac{1}{16}$ (f) $\frac{1}{4} - \frac{3}{16}$ (g) $\frac{3}{4} - \frac{1}{16}$ (h) $\frac{1}{2} - \frac{5}{16}$

   (i) $\frac{1}{4} - \frac{1}{12}$ (j) $\frac{1}{2} - \frac{1}{12}$ (k) $\frac{5}{12} - \frac{1}{4}$ (l) $\frac{3}{4} - \frac{1}{12}$

$$\frac{7}{8} - \frac{5}{6} = \frac{21 - 20}{24} = \frac{1}{24}$$

2. Find the value of:

   (a) $\frac{1}{2} - \frac{2}{5}$ (b) $\frac{2}{3} - \frac{1}{4}$ (c) $\frac{2}{3} - \frac{2}{5}$ (d) $\frac{2}{3} - \frac{3}{8}$ (e) $\frac{1}{2} - \frac{3}{7}$

   (f) $\frac{3}{4} - \frac{3}{5}$ (g) $\frac{1}{2} - \frac{2}{9}$ (h) $\frac{2}{3} - \frac{2}{9}$ (i) $\frac{5}{6} - \frac{3}{4}$ (j) $\frac{4}{5} - \frac{3}{4}$

$$4\frac{5}{6} - 2\frac{2}{9} = 2\frac{15 - 4}{18} = 2\frac{11}{18}$$

3. Find the value of:

   (a) $5\frac{1}{2} - 2\frac{2}{5}$ (b) $3\frac{5}{8} - 1\frac{1}{8}$

   (c) $3\frac{5}{6} - 1\frac{4}{6}$ (d) $6\frac{7}{8} - 5\frac{5}{12}$

$$3\frac{1}{3} - 1\frac{3}{4} = 2\frac{4 - 9}{12} = 1\frac{16 - 9}{12} = 1\frac{7}{12}$$

In the first step of this example, it looks as if $\frac{9}{12}$ are to be taken from $\frac{4}{12}$. To overcome this difficulty, 1 (whole one) is taken from the 2, and changed into $\frac{12}{12}$; then $\frac{12}{12} + \frac{4}{12}$ give the $\frac{16}{12}$ in the next step.

4. Find the value of:

   (a) $3\frac{1}{6} - 1\frac{3}{4}$ (b) $6\frac{2}{3} - 2\frac{4}{5}$ (c) $7\frac{1}{2} - 3\frac{3}{5}$

   (d) $9\frac{3}{10} - 5\frac{5}{6}$ (e) $4\frac{2}{3} - 1\frac{5}{6}$ (f) $3\frac{3}{4} - 1\frac{7}{8}$

5. (a) What is the value of: $5\frac{1}{4} - 2\frac{3}{4}$?

   (b) Draw a line AB ($5\frac{1}{4}''$). From B, measure BC ($2\frac{3}{4}''$) backwards; that is, to the left. What is the length of AC? Does this agree with your answer in (a)?
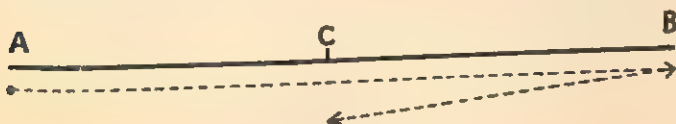
6. (a) Find the value of: $4\frac{1}{2} - 1\frac{7}{8}$.

   (b) Check your answer by drawing.

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EXERCISE 41.   ADDITION AND SUBTRACTION OF VULGAR FRACTIONS

$$2\tfrac{1}{2} - 3\tfrac{2}{3} + 3\tfrac{3}{4} = 2\tfrac{6-8+9}{12} = 2\tfrac{7}{12}$$

1. Work the following:
   (a) $\tfrac{3}{4} + \tfrac{1}{2} - \tfrac{3}{8}$ (b) $\tfrac{1}{2} - \tfrac{5}{6} + \tfrac{7}{8}$ (c) $1\tfrac{5}{9} + 1\tfrac{1}{3} - 1\tfrac{1}{2}$
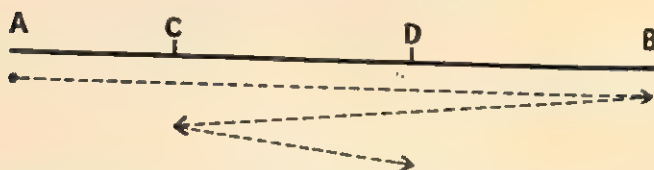   (d) $3\tfrac{2}{3} - 1\tfrac{5}{6} + 2\tfrac{1}{2}$ (e) $7\tfrac{1}{4} - 8\tfrac{2}{3} + 6\tfrac{1}{2}$ (f) $2\tfrac{1}{3} - 5\tfrac{1}{2} + 7\tfrac{1}{4}$

2. (a) Find the value of: $3\tfrac{3}{8} - 2\tfrac{1}{2} + 1\tfrac{1}{4}$.
   (b) Draw a straight line of any length.   From A, measure AB ($3\tfrac{3}{8}''$) to the right; from B, measure BC ($2\tfrac{1}{2}''$) to the left; and then from C, measure CD ($1\tfrac{1}{4}''$) to the right.   Find the length from A to D. Does this agree with your answer to (a)?

The arrows show the direction in which you should measure.   You will note that we add on a ruler by measuring to the right, and subtract by measuring to the left.

3. Find the value of: $2\tfrac{1}{2} + 1\tfrac{7}{8} - 1\tfrac{3}{4}$, and test your answer by drawing.

4. Work the following examples.   Check each answer by making a drawing.
   (a) $1\tfrac{5}{8}'' + 2\tfrac{3}{4}''$ (b) $4\tfrac{1}{8}'' - 1\tfrac{3}{4}''$ (c) $1\tfrac{1}{2}'' + 1\tfrac{3}{8}'' + 1\tfrac{7}{8}''$
   (d) $2\tfrac{1}{2}'' + 1\tfrac{5}{8}'' - 1\tfrac{3}{4}''$ (e) $4\tfrac{7}{8}'' - 3\tfrac{1}{2}'' + 1\tfrac{5}{8}''$ (f) $3\tfrac{3}{8}'' - 1\tfrac{3}{4}'' + 2\tfrac{1}{2}''$

5. The notecase is made by folding the sheet of paper along the dotted lines What is the width of the overlap (AB)?
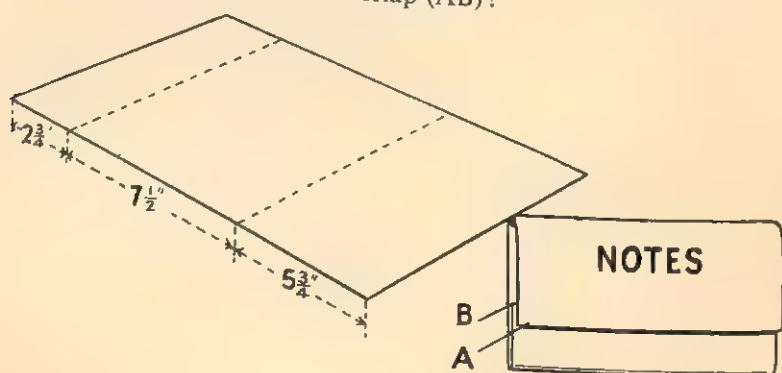
XIV. AREA AND VOLUME

SOMETHING TO READ: THE CUBIC-INCH

Look at the drawing of an Oxo cube and be ready
to answer the following questions:

(*a*) How many faces has the cube?
(*b*) What is the shape of each face?
(*c*) Why is lump sugar also called cube sugar?

The first figure below shows a cube of plasticine having each of its faces
an inch square. It is called an inch cube.

The second figure shows this inch cube after it has been rolled into a ball,
and the third figure shows it after it has been pressed into a slab.
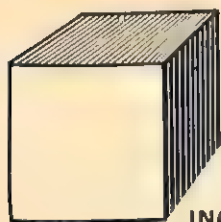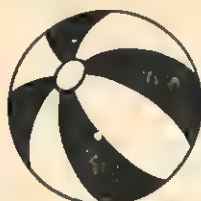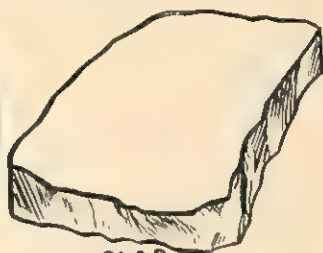
INCH CUBE   BALL   SLAB

The cube, the ball and the slab each has the same size or **volume.**

As they are all equal in size (or **volume**) to the inch cube, we say each
has a volume of a **cubic-inch.**

> **LEARN**
> A CUBIC-INCH is a VOLUME equal to the
> volume (or size) of an inch cube.

The drawing below shows a two-inch cube of soap. Look at it carefully
and be ready to answer these questions.
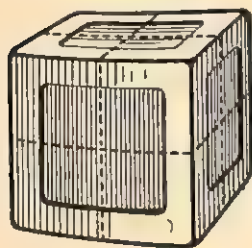
(*a*) How many inch cubes could you cut from
this piece of soap?
(*b*) What is the *volume* of this piece of soap?
(*c*) How many inch cubes could you cut from a
three-inch cube?
(*d*) What is the volume of a three-inch cube?

EXERCISE 42. VOLUME OF RECTANGULAR BOX
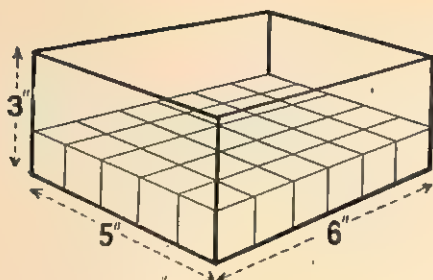
Look at this sketch of a chocolate box 6 inches long, 5 inches wide, and 3 inches high. When the bottom is filled with inch cubes, there is a row of six along the length of the box and five rows, or 30 of these inch cubes.

Two more layers could be placed in the box.

Therefore, the **volume** of the box is (3 × 30), or 90 cubic-inches.

1. A cigarette box is 8 inches long, 3 inches wide, and 2 inches deep.
   - (a) What is the area of the bottom of this box?
   - (b) How many inch cubes could be, placed on the bottom of the box?
   - (c) What is the volume of the box?
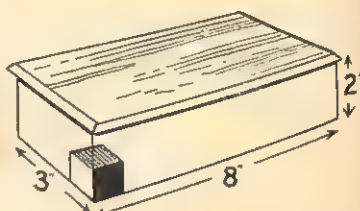
2. (a) A drawer is 6 inches wide and 10 inches long. What is the area, of the bottom?
   - (b) If this drawer is 3 inches deep, what is its volume?
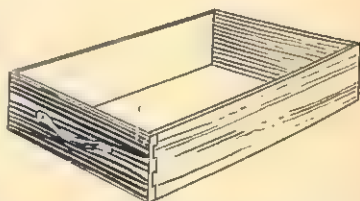
3. Find (a) the area of the bottom, and
   (b) the volume of a box, 9 inches long, 5 inches wide, and 4 inches high.

LENGTH   AREA   VOLUME

EXERCISE 43. CODE WORDS

In order that the assistants in the shop may remember the code easily, the tradesman usually chooses a word, or a sentence, which contains ten different letters.
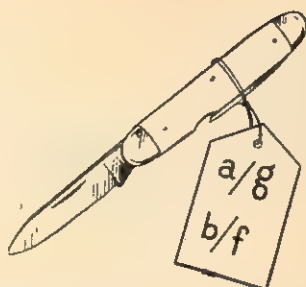
Examples of these codes are:

REDUCTIONS	REGULATION	PLAY WITH ME	COME UP JAYS
1234567890	1234567890	1234 5678 90	1234 56 7890

1. What would you have to pay for goods marked as below in a shop where the code word was REGULATION?

   (a) g/a   (b) t/r   (c) u/t   (d) e/e   (e) r/n.

2. Using the code PLAY WITH ME, how would you mark goods to be sold at:

   (a) 4/3   (b) 5/4   (c) 7/2   (d) 9/7   (e) 8/–.

3. In a draper's shop each ticket had two marks; the first of these showed what the draper gave for the article, and the second showed his selling-price. If his code word was REDUCTIONS, find the profit he made on articles marked:

   (a) e/d   (b) d/n   (c) r/s   (d) t/c   (e) r/n
       d/s   c/s   r/u   o/i   e/t

4. Using the code COME UP JAYS, find the value of:

   (a) $m + j$ (b) $e + s$ (c) $a - o$ (d) $p - u$
   (e) $pc = (p \times c)$ (f) ey (g) jp (h) $2m = (2 \times m)$
   (i) $3j$ (j) $7e$ (k) $2e + 2p$ (l) $2a + 2s$
   (m) $mpe = (m \times p \times e)$ (n) ome (o) ycu

   (p) $\frac{a}{e} = (a \div e)$ (q) $\frac{c}{m}$ (r) $\frac{p}{m}$

   ```
   LEARN
         ab = a × b      2a = 2 × a
             abc = a × b × c
   ```

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EXERCISE 44. AREA AND VOLUME

From Exercise 42 you will see that we can find the **number** of cubic-inches in a box ; that is, the volume of the box, by multiplying the **number** of inches in its length by the **number** of inches in its breadth by the **number** of inches in its height.

If a box is l inches long, b inches wide, and h inches high, then its volume is $l \times b \times h$ (or lbh) cubic-inches.

LEARN
Volume of Box $= l \times b \times h$
or $\qquad$ $V = lbh$
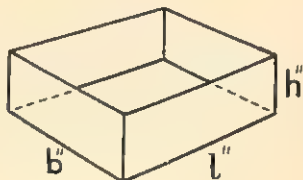
Find the volume of a box 12 inches long, 6 inches wide, and 3 inches high.
$V = lbh = 12 \times 6 \times 3 = 216$
Volume $= 216$ cubic-inches.

1. Find the volume of boxes with the following measurements:

Length	Width	Height
8 in.	4 in.	3 in.
7 in.	6 in.	2 in.
7 in.	5 in.	4 in.
6 in.	$3\frac{1}{2}$ in.	3 in.

2. The rectangle ABCD is 8 inches long and 6 inches wide. What is the:

(a) Total length of the long sides (AB and CD)?
(b) Total length of the short sides (AD and BC)?
(c) Perimeter of this rectangle?
(d) Total length of AB and BC (half the perimeter)?

From your last answer find the perimeter of the rectangle.

From the last question, you will see that if a rectangle is l inches long and b inches wide, then its perimeter is $2l + 2b$ inches, or twice $(l + b)$. Twice $(l + b)$ is written as $2(l + b)$.

LEARN
Perimeter of rectangle $= 2(l + b)$
or $\qquad$ $P = 2(l + b)$

> Find the perimeter of a rectangle, $7\frac{1}{4}$ inches
> long and $3\frac{3}{4}$ inches wide.
>
> $$P = 2(l + b) = 2(7\frac{1}{4} + 3\frac{3}{4}) = 2 \times 11 = 22$$
> Perimeter $= 22$ inches.

3. Find the perimeter of rectangles having the following measurements:
   (a) Length, $10\frac{1}{2}$ inches; width, 5 inches.
   (b) Length, $6\frac{1}{2}$ inches; width, $3\frac{1}{2}$ inches.
   (c) Length, $12\frac{1}{4}$ inches; width, $3\frac{1}{4}$ inches.
   (d) Length, $9\frac{3}{8}$ inches; width, $3\frac{5}{8}$ inches.
   Check each answer by finding the total length of the two long sides
   and the total length of the two short sides.

4. A rectangle, having a length of 7 inches and an area of 42 square-inches,
   has been divided into inch squares.
   (a) How many inch squares will there be in this rectangle?
   (b) How many inch squares would there be in the bottom row?
   (c) What would be the width of this rectangle? Check your answer
       by drawing the rectangle.

5. A rectangle, having a breadth of 5 inches and an area of 30 square-inches,
   has been divided into inch squares.
   (a) How many inch squares are in this rectangle?
   (b) How many inch squares are close to one of the 5-inch sides?
   (c) What is the length of this rectangle? Check your answer by
       drawing the rectangle.

> **LEARN**
>
> $l = A \div b$ or $\dfrac{A}{b}$
>
> $b = A \div l$ or $\dfrac{A}{l}$

> What is the length of a rectangle having an area
> of 72 square-inches, and a width of 8 inches?
> $$l = \frac{A}{b} = \frac{72}{8} = 9$$
> Length $= 9$ inches.

6. What is the width of a rectangle with an area of 60 square-inches and a
   length of 12 inches?
7. The table below gives the areas of four rectangles. Find the missing
   measurement in each case.

Area	Length	Width
660 sq. in.	30 in.	(a)
620 sq. in.	(b)	20 in.
456 sq. in.	(c)	19 in.
884 sq. in.	34 in.	(d)
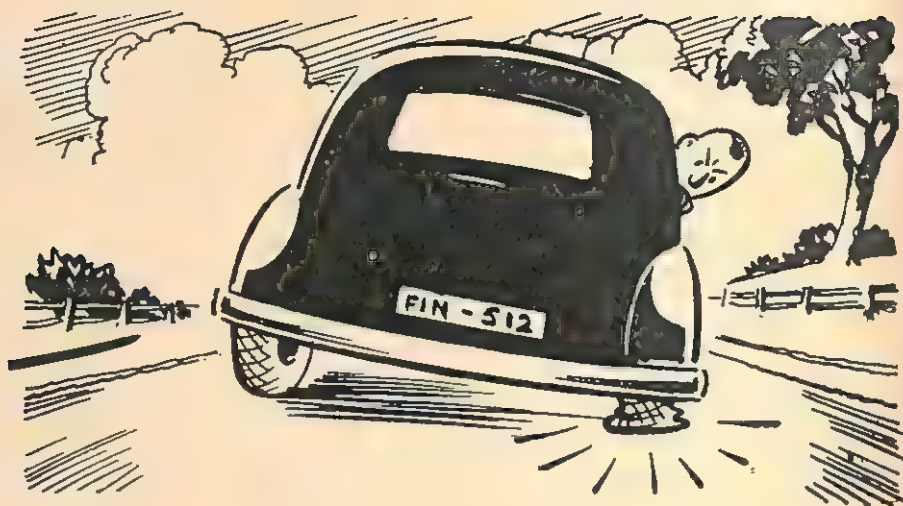
XV. REVISION

EXERCISE 45. LOOKING BACKWARDS

First Glance

1. Find the cost of each of the following:
  (a) Postage on a letter weighing $5\frac{1}{2}$ oz.; (b) postage on a parcel weighing $7\frac{1}{2}$ lb.; and (c) postal order for 7s. 4d.

2. What would be the cost of sending the following telegram?
  Tenderfoot 15 Delph Street Midbrough Arriving Oldcastle to-day Bring car and case Scout.

3. (a) Write the following improper fractions as mixed numbers:
$$\frac{27}{8} \qquad \frac{15}{7} \qquad \frac{20}{9} \qquad \frac{12}{5} \qquad \frac{11}{3}$$
  (b) Write the following mixed numbers as improper fractions:
$$2\frac{1}{5} \qquad 5\frac{3}{8} \qquad 1\frac{7}{9} \qquad 2\frac{3}{5} \qquad 4\frac{2}{7}$$

4. Copy and fill in the missing figures below:
$$\frac{\ast}{4} = \frac{7}{\ast} = \frac{\ast}{8} = \frac{\ast}{20} = \frac{3}{12} = \frac{9}{\ast}$$

Second Glance

1. Find the largest, and the smallest, of the following fractions:
$$\frac{5}{12} \qquad \frac{3}{8} \qquad \frac{11}{24} \qquad \frac{7}{16}$$

2. A man spends $\frac{1}{3}$ of the day working, $\frac{3}{8}$ in sleeping, and $\frac{1}{6}$ in recreation. The remainder is time spent on meals. How many hours do his meals take up?

3. In the following examples, use the code given below:

c	g	j	k	s	a	b	m	r	d
1	2	3	4	5	6	7	8	9	0

(a) Find the price of articles marked: g/a; c/r; k/j; a/b; m/d.

(b) What letters would be used for articles to be sold at: 5/1; 3/2; 4/–; 7/6; 9/8?

4. Using CUMBERLAND as the code word, find the value of:

(a) $r+l$ (b) $u + e$ (c) $n - r$ (d) $l - b$

(e) nl (f) ar (g) $3m$ (h) $7u$

(i) mub (j) cer (k) $\dfrac{a}{u}$ (l) $\dfrac{n}{m}$

(m) $2(m + l)$ (n) $2(c + r)$

Third Glance

1. Find the total weekly wages of 21 men at £4 18s. 6d. a week and 7 boys at 27s. 9d. a week.

2. Each pupil in a class of 38 girls decided to give $\frac{1}{2}d.$ each week towards the hospital. What would be the total amount given to the hospital in a year of 42 weeks?

3. Find the value of: $2\frac{5}{8} + 1\frac{3}{4} - 2\frac{1}{2}$, and check your answer by drawing.

4. A teacher paid £5 12s. to the station-master as fares for himself and a party of boys. The teacher's fare was 10s. 8d. and the boys travelled at half-price. How many boys were there in the party?

USING
A SET-SQUARE
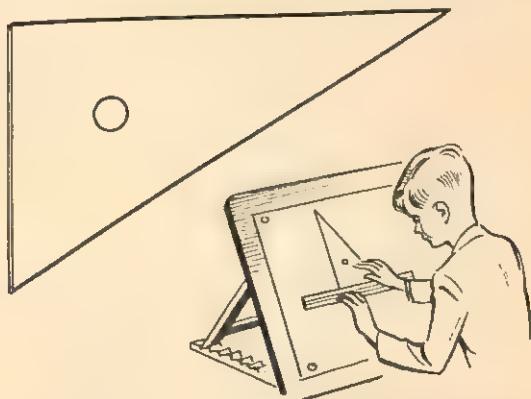
EXERCISE 46. MECHANICAL SUMS

Set A. Compound Rules

Nos. 1 to 4 are addition sums; Nos. 5 to 8 are subtraction sums.

1.	s.	d.
	10	6
	12	7½
	13	5¾
	9	11¾

2.	tons	cwt.	qr.
	15	15	2
	7	10	3
	6	17	3
	10	12	2

3.	ml.	fur.	chn.
	1	7	7
		5	5
	2	4	8

4.	gal.	qt.
	3	3
	1	3
	3	2
	3	1

5.	s.	d.
	33	3
	18	10½

6.	gal.	qt.	pt.
	10	0	0
	7	3	1

7.	cwt.	qr.	lb.
	19	3	0
	12	3	22

8.	st.	lb.
	10	8½
	6	11¾

9. 2 hr. 15 min. × 10
11. £16 13s. ÷ 6
13. £5 17s. 10½d. × 23
15. 237 gal. 2 qt. ÷ 38
17. 45 tons 16 cwt. 2 qr. ÷ 39

10. 15s. 7½d. × 19
12. 5 lb. 8 oz. × 7
14. £3 19s. 3½d. × 47
16. 7 cwt. 3 qr. × 26

18. How many times is 7s. 7½d. contained in £3 1s.?
19. How many times is 5 ft. 7 in. contained in 100½ yd.?
20. Change 3s. 9½d. to farthings.
21. Change 3 tons 12 cwt. to quarters.
22. Change 5,096 lb. to cwt. and qr.
23. Change 712 inches to yd. ft. in.

Set B. Addition of Fractions

1. $\frac{1}{8} + \frac{5}{12} + \frac{3}{4}$

4. $1\frac{1}{2} + 2\frac{2}{3} + 1\frac{5}{6}$

2. $2\frac{3}{5} + 1\frac{1}{2} + \frac{7}{10}$

5. $1\frac{3}{5} + 2\frac{3}{4} + \frac{7}{10}$

3. $3\frac{1}{2} + 4\frac{2}{5} + 5\frac{1}{6}$

6. $3\frac{3}{8} + 1\frac{1}{2} + 2\frac{5}{6}$

Set C. Subtraction of Fractions

1. $\frac{5}{6} - \frac{2}{3}$ 2. $\frac{4}{5} - \frac{3}{4}$ 3. $3\frac{3}{4} - 1\frac{2}{3}$ 4. $4\frac{1}{2} - 2\frac{2}{3}$ 5. $10\frac{1}{3} - 2\frac{5}{7}$

Set D. Addition and Subtraction of Fractions

1. $\frac{2}{3} + \frac{5}{9} - \frac{5}{6}$

4. $\frac{1}{4} + \frac{7}{8} - \frac{15}{16}$

7. $\frac{2}{3} - \frac{3}{4} + \frac{1}{2}$

2. $3\frac{5}{6} + 1\frac{7}{9} - 2\frac{2}{3}$

5. $2\frac{1}{2} - 2\frac{7}{8} + 3\frac{5}{6}$

8. $2\frac{13}{16} + 3\frac{5}{8} - 4\frac{3}{4}$

3. $5\frac{1}{2} - 1\frac{3}{4} + 2\frac{2}{3}$

6. $5\frac{3}{5} - 2\frac{3}{4} - 1\frac{3}{10}$

9. $5\frac{7}{12} - 2\frac{3}{4} - 1\frac{5}{8}$

XVI. ACCOUNTS

EXERCISE 47. SHOPPING BILLS

1. (*a*) Find the total cost of the following: 1½ doz. eggs at 2/9 per doz.; 2 lb. butter at 1/8 per lb.; and 3½ lb. of lard at 10*d.* per lb.

(*b*) Ask your mother what she pays for eggs, butter and lard, and find the total cost of the above at the present time.

2. Copy the following bill into your book, and fill in the missing figures:

		s.	*d.*
2½ lb. beef at 1/10 per lb.	.. ..	*	*
* lb. lard at 8*d.* per lb.	.. ..	1	4
1½ lb. suet at *s. per lb.	.. ..	1	6
		*	*

3. Check each item (that is, each line) in the following bills. Correct all errors and re-write the *money columns* in your book.

	s.	*d.*
(*a*) 6 lb. apples at 6½*d.* per lb.	3	0
½ doz. bananas at 2/6 per doz.	1	6
¼ doz. lemons at 1/4 per doz. ..		7
14 lb. potatoes at 2 lb. for 2½*d.*	1	2
	7	0

	s.	*d.*
(*b*) 3 doz. boxes matches at 1/6 per doz. ..	3	6
3½ lb. sugar at 5*d.* per lb.	1	4½
2 lb. lard at 8½*d.* per lb.	1	7
	6	5½

	s.	*d.*
(*c*) 1¼ yd. material at 7/10 a yd.	9	10
¾ yd. trimming at 1/4 a yd.	1	0
3 doz. buttons at 1/3 per doz.	4	0
	14	10

EXERCISE 48. SHORT METHODS

1. Find the value of the following:
    (a) 1d., 2d., 3d., 7d., 11d., 1/2, 2/1   ×   12
    (b) 5d., 6d., 5½d., 8½d., 8¼d., 8¾d., 10¾d. ×   12
    (c) 1/3, 1/7, 1/2½, 1/5¾, 1/1¼, 1/0½, 1/7¾. ×   12
    (d) 3½d. × 12, 13, 11, 24, 25, 23, 36.

2. Find the value of the following:
    (a) 1/–, 2/–, 3/–, 9/–, 18/–, 13/–, £1 5s.   ÷   12
    (b) 5/–, 6/–, 5/6, 5/3, 5/9, 10/3, 15/9   ÷   12

LEARN

To find the cost of a dozen when given the cost of one, call the number of pence, shillings.

3½d. each is 3½s. (3/6) a dozen.

To find the cost of one when given the cost of a dozen, call the number of shillings, pence.

4/3 (4¼s.) a dozen is 4¼d. each.

---

3. Find the cost of a dozen articles at the following prices:
    9d., 7½d., 2¾d., 11¼d., 1/3¼, 1/8½, 2/1¼ each.

4. Find the cost of an article at the following prices per dozen:
    3/6, 2/9, 11/3, 19/9, £1 2s., £1 7s. 3d.

5. Find the value of the following:
    (a) 1/–, 2/–, 3/–, 6/–, 15/–, 19/–, £1 7s. × 20
    (b) 4/–, 5/–, 4/6, 4/9, 5/3, 16/9, 12/3   × 20
    (c) 3/3 × 20, 21, 19, 22, 40, 42, 39.

6. Find the value of the following:
    £1, £2, £3, £6 10s., £3 5s., £7 15s.   ÷ 20

LEARN

To find the cost of a score (20) when given the cost of one, call the number of shillings, pounds (£).

2/3 (2¼s.) each is £2¼ (£2 5s.) a score.

To find the cost of one when given the cost of a score, call the number of pounds (£), shillings.

£3 15s. 0d. (£3¾) a score is 3¾s. (3/9) each.

---

7. Find the cost of a score of articles at 7/9 each.

8. Find the cost of a ton at: 17/3, 13/6, 11/9, 19/9, £1 3s. 3d. a hundredweight.

9. Find the cost of a hundredweight at the following prices a ton:
    £2 10s., £1 15s., £3 15s., £7 5s., £10 10s.

10. Find the value of the following:

(a) $\frac{1}{4}d.$, $\frac{1}{2}d.$, $\frac{3}{4}d.$, $1\frac{1}{4}d.$, $2\frac{1}{2}d.$, $3\frac{1}{4}d.$ × 16

(b) 4d., 8d., 1/–, 1/8, 2/4, 3/8   ÷ 16

11. Find the cost of:

(a) 1 lb. at $1\frac{1}{2}d.$, $1\frac{3}{4}d.$, $2\frac{1}{4}d.$, $3\frac{3}{4}d.$, $5\frac{1}{4}d.$ per oz.

(b) 1 oz. at 1/4, 2/–, 2/8, 6/4, 5/8 per lb.

12. Find the value of the following:

(a) 5/– × 4, 8, 16, 17.

(b) 2/6 × 8, 16, 9, 15.

(c) 6/8 × 3, 6, 12, 10.

(d) 3/4 × 6, 12, 17, 23.

(e) 10/–, 6/8, 5/–, 3/4, 2/6, 1/8, 1/3 × 84.

13. Find the cost of:

(a) 6 articles at 10/– each.

(b) 6 articles at 9/11 each.

(c) 5 articles at £1 each.

(d) 5 articles at 19/10 each.

(e) 18 articles at 1/– each.

(f) 18 articles at $11\frac{1}{2}d.$ each.

(g) 16 articles at 2/6 each.

(h) 16 articles at 2/7 each.

14. Find the value of:

(a) 1d., 2d., 3d., 7d., 9d., 11d., 1/2   × 240.

(b) 3d., 4d., $3\frac{1}{2}d.$, $3\frac{3}{4}d.$, $7\frac{1}{4}d.$, $8\frac{1}{2}d.$, $1/3\frac{1}{2}$ × 240.

(c) $7\frac{1}{2}d.$ × 240, 241, 242, and 238.

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Bills are usually made out on specially prepared sheets of paper, known as billheads. You will often find it useful, however, to make out a bill on plain paper. The heading for such a bill must give:

    (i) your address;

    (ii) the date;

    (iii) the name of your debtor, or customer, and

    (iv) your own name.

In the example below, you will see that Mr. Thompson, who lives in High Street, Lowport, has been working for Mr. Cartwright; that the bill was sent on the 26th May; and that it was receipted on 30th May.

Note.—(i) *Mr.* is placed before the debtor's name, but *not* before the name of the man sending the bill.

    (ii) A twopenny (2*d.*) stamp is not needed on a receipt if the total amount is less than £2.

1. (*a*) F. James has been carrying soil for J. Jackson at 15/6 a load. Who would make out the bill in this case?

    (*b*) Make out the bill showing that F. James has carried 10 loads. Date the bill 15th May.

    (*c*) Receipt this bill, showing that it was paid on 23rd May. Why is it necessary to use a 2*d.* stamp when receipting this bill?

2. T. Kelso sold the following goods to Mr. S. Jones. Make out and receipt T. Kelso's bill.

    4 bags of cement at 3/6 a bag; 2 loads of sand at 5/- a load; ½ cwt. of lime at 4/6 per cwt.

3. (*a*) Your father has been gardening for Mr. D. Smith for 4½ days. Make out the bill which your father would send to Mr. Smith on the 5th April, if your father charges 17/6 a day.

    (*b*) Receipt this bill, showing that Mr. Smith paid the account on the 9th April.

4. (a) The greengrocer, A. Green, sold the following to Mrs. Brown on the 8th June. Make out the bill which would be sent with these goods.

12 lb. potatoes at 4 lb. for 3d.; 4 lb. swede turnips at 2 lb. for 1½d.; 3 lb. cooking apples at 5½d. per lb.; 2 lb. pears at 1/– per lb.; 4 lb. cabbages at 4½d. per lb.; 1 lb. tomatoes at 1/2 per lb.; 9 lemons at 1½d. each.

(b) Receipt this bill, showing that Mrs. Brown paid for the goods on the 10th June.

5. Make out and receipt a bill for the following goods. Choose names for the grocer and his customer.

½ lb. tea at 3/2 per lb.; 4 lb. sugar at 5d. per lb.; 2 lb. butter at 1/8 per lb.; ¼ lb. cheese at 1/4 per lb.; 3 packets of dry soap at 7½d. a packet; 1 doz. boxes of matches at 1/4 per dozen.

6. The following is a copy of a delivery note; that is, a note given to the customer when the goods are delivered. The **gross weight** is the total weight of the cart and the coal; the **tare** is the weight of the cart; and the **nett weight** is the weight of the coal.

	Tons	cwt.	qr.	Description
Gross weight	2	5	1	Kitchen Nuts
Tare		17	3	at 55/- ton
Nett weight				

TELEPHONE OXHam 2314

DELIVERY NOTE

M.A. TURNER & SONS
COAL MERCHANTS

The Sidings OXHAM

What is the nett weight of the coal delivered here?

7. (a) Make out a delivery note for the following:

Gross weight, 1 ton 19 cwt. 3 qr. ;
Tare, 17 cwt. 3 qr. ;
Description of coal, Dudley Brilliant at 85/– a ton.

(b) What was the cost of the coal delivered?
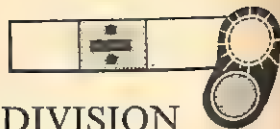
# XVII. MULTIPLICATION AND DIVISION
VULGAR FRACTIONS

EXERCISE 50. READING DIAGRAMS—FRACTIONS OF FRACTIONS

1. From your ruler find the value of: (a) $\frac{1}{2}$ of $\frac{1}{2}$ (b) $\frac{1}{2}$ of $\frac{1}{4}$ (c) $\frac{1}{2}$ of $\frac{3}{4}$

2. The first rectangle below has been divided into five equal parts by the dotted vertical lines, and one-fifth has been shaded.
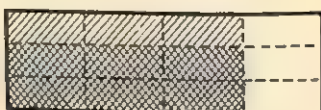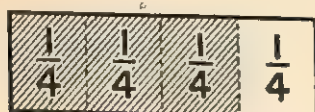
   In the second rectangle, each fifth has been divided into three parts by the dotted horizontal lines.
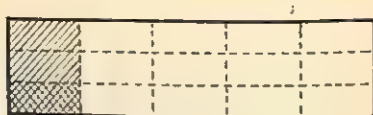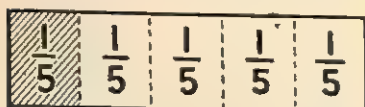
   (a) Into how many parts is the second rectangle divided?
   (b) What is the value of $\frac{1}{3}$ of $\frac{1}{5}$?

3. From the diagrams below, write down the value of $\frac{1}{2}$ of $\frac{3}{5}$.
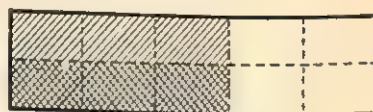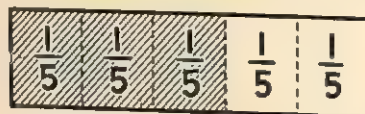
4. From the diagrams below, write down the value of $\frac{2}{3}$ of $\frac{3}{4}$.

$$\frac{2}{3} \text{ of } \frac{1}{5} = \frac{2 \times 1}{3 \times 5} = \frac{2}{15}$$
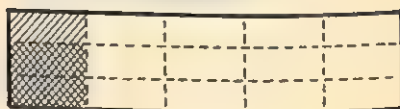
5. Find the value of:

   (a) $\frac{1}{4}$ of $\frac{1}{3}$ (b) $\frac{1}{2}$ of $\frac{1}{5}$ (c) $\frac{1}{2}$ of $\frac{1}{3}$ (d) $\frac{1}{4}$ of $\frac{1}{4}$

   (e) $\frac{1}{3}$ of $\frac{1}{3}$ (f) $\frac{1}{2}$ of $\frac{1}{6}$ (g) $\frac{1}{2}$ of $\frac{5}{6}$ (h) $\frac{1}{2}$ of $\frac{5}{8}$

   (i) $\frac{1}{2}$ of $\frac{3}{8}$ (j) $\frac{1}{3}$ of $\frac{5}{6}$ (k) $\frac{1}{3}$ of $\frac{5}{8}$ (l) $\frac{1}{4}$ of $\frac{3}{5}$

   (m) $\frac{1}{4}$ of $\frac{3}{8}$ (n) $\frac{1}{3}$ of $\frac{4}{5}$ (o) $\frac{2}{3}$ of $\frac{4}{5}$ (p) $\frac{1}{5}$ of $\frac{2}{3}$

   (q) $\frac{2}{5}$ of $\frac{2}{3}$ (r) $\frac{1}{4}$ of $\frac{5}{2}$ (s) $\frac{3}{4}$ of $2\frac{1}{2}$ $\left(\frac{5}{2}\right)$ (t) $\frac{2}{5}$ of $1\frac{1}{3}$ $\left(\frac{4}{3}\right)$

6. Draw a line $2\frac{1}{2}$ inches long, and divide it into four equal parts. What is the length of each part? What is the length of $\frac{3}{4}$ of $2\frac{1}{2}$ inches? Does this agree with your answer to Question 5 (s)?

EXERCISE 51. MULTIPLICATION AND DIVISION

$$\frac{5}{6} \div 4 = \frac{1}{4} \text{ of } \frac{5}{6} = \frac{1 \times 5}{4 \times 6} = \frac{5}{24}$$

1. Find the value of:
   - (a) $\frac{2}{3} \div$ 3, 5, 7, 9.
   - (b) $\frac{3}{8} \div$ 4, 7, 8, 11.
   - (c) $2\frac{5}{6} \div$ 3, 5, 6, 9.
   - (d) $3\frac{1}{5} \div$ 3, 5, 7, 9.

2. (a) Find the value of $3\frac{1}{2} \div 4$.
   (b) Check your answer by drawing a line $3\frac{1}{2}$ inches long and dividing it into four equal parts.

> Three times five shillings is fifteen shillings. Three times five-sevenths is fifteen-sevenths.
>
> $$\frac{5}{7} \times 3 = \frac{15}{7} = 2\frac{1}{7}$$
>
> $$3\frac{1}{3} \times 5 = 15\frac{5}{3} = 16\frac{2}{3}$$

3. Find the value of:
   - (a) $\frac{5}{6} \times$ 2, 5, 7, 11.
   - (b) $\frac{3}{8} \times$ 3, 5, 7, 9.
   - (c) $2\frac{2}{3} \times$ 4, 5, 8, 10.
   - (d) $3\frac{3}{4} \times$ 3, 7, 9, 11.

4. (a) Find the value of $1\frac{3}{4} \times 3$.
   (b) Check your answer by drawing a line of any length and marking off $1\frac{3}{4}$ inches three times.

5. (a) What is the value of: $\frac{3}{4} \times 5$?
   (b) From your last answer find the value of: $\frac{3}{4} \times 2\frac{1}{2}$.

$$\frac{3}{4} \times 2\frac{1}{2} = \frac{3}{4} \times \frac{5}{2} = \frac{15}{8} = 1\frac{7}{8}$$

6. Find the value of:
   - (a) $\frac{1}{3} \times \frac{4}{5}$
   - (b) $\frac{2}{3} \times \frac{4}{5}$
   - (c) $\frac{1}{7} \times \frac{3}{4}$
   - (d) $\frac{3}{4} \times \frac{5}{7}$
   - (e) $\frac{5}{8} \times \frac{3}{4}$
   - (f) $\frac{3}{4} \times 3\frac{1}{2}$
   - (g) $\frac{5}{8} \times 1\frac{2}{3}$
   - (h) $3\frac{1}{3} \times 1\frac{1}{4}$

7. (a) What is the value of $\frac{2}{3} \div 5$?
   (b) From your last answer, find the value of $\frac{2}{3} \div 2\frac{1}{2}$.

$$\frac{2}{3} \div 2\frac{1}{2} = \frac{2}{3} \times \frac{2}{5} = \frac{4}{15}$$

8. (a) $\frac{3}{4} \div \frac{2}{7}$
   (b) $\frac{5}{6} \div \frac{3}{5}$
   (c) $\frac{2}{3} \div \frac{3}{5}$
   (d) $\frac{7}{8} \div \frac{2}{5}$
   (e) $5\frac{1}{2} \div 2\frac{2}{3}$
   (f) $1\frac{2}{3} \div 1\frac{3}{4}$
   (g) $3\frac{1}{4} \div 1\frac{2}{3}$
   (h) $1\frac{1}{3} \div 1\frac{2}{5}$

EXERCISE 52. SIMPLIFYING OR CANCELLING

$$\frac{5}{9} \times \frac{3}{10} = \frac{15}{90} = \frac{1}{6}$$

The answer ($\frac{15}{90}$) has been brought to its lowest terms ($\frac{1}{6}$) by dividing the numerator and denominator by 15.

This division of the numerator and denominator by 15 may be done earlier by dividing the numerators and denominators of the fractions by 5 and 3.

$$\frac{5}{9} \times \frac{3}{10} = \frac{\overset{1}{5}}{\underset{3}{9}} \times \frac{\overset{1}{3}}{\underset{2}{10}} = \frac{1}{6}$$

$$3\frac{3}{4} \div 3\frac{1}{3} = \frac{15}{4} \times \frac{\overset{3}{3}}{\underset{2}{10}} = \frac{9}{8} = 1\frac{1}{8}$$

This division of the **numerator** and **denominator** by the same number is known as **cancelling**. In the last example we have **cancelled** by 5.

1. Find the value of each of the following:

(a) $\frac{2}{3} \times \frac{3}{7}$ (b) $\frac{3}{4} \times \frac{5}{6}$ (c) $\frac{4}{5} \times \frac{5}{8}$ (d) $\frac{7}{8} \times \frac{4}{5}$

(e) $3\frac{3}{5} \times 3\frac{1}{3}$ (f) $4\frac{1}{4} \times 1\frac{3}{5}$ (g) $3\frac{1}{3} \times 1\frac{2}{5}$ (h) $2\frac{2}{5} \times 3\frac{3}{4}$

(i) $\frac{3}{4} \div \frac{5}{6}$ (j) $\frac{2}{3} \div \frac{5}{9}$ (k) $\frac{3}{5} \div \frac{6}{7}$ (l) $\frac{5}{8} \div \frac{3}{4}$

(m) $3\frac{1}{3} \div 1\frac{1}{3}$ (n) $3\frac{3}{4} \div 1\frac{1}{4}$ (o) $4\frac{1}{2} \div 1\frac{1}{6}$ (p) $6\frac{2}{3} \div 2\frac{7}{9}$

Find the value of: $35 \times 24 \div 56$

$$35 \times 24 \div 56 = \frac{\overset{5}{35} \times \overset{3}{24}}{\underset{8}{\underset{1}{56}}} = 15$$

2. Find the value of each of the following by cancelling:

(a) $\frac{72 \times 42}{56}$ (b) $\frac{63 \times 15}{35}$ (c) $\frac{132 \times 49}{84}$ (d) $\frac{110 \times 21}{77}$

3. Check your answers in the last question by working each example in full.

4. Find the value of:

(a) $\frac{35 \times 110}{55}$ (b) $\frac{48 \times 112}{192}$ (c) $\frac{54 \times 91}{63}$ (d) $\frac{72 \times 84}{126}$

(e) $220 \div 154 \times 28$ (f) $58 \times 234 \div 156$

EXERCISE 53.   PROBLEMS (FRACTIONS)

1. (*a*) In a History examination a boy received 56 marks.   Give his marks as a fraction of the 80 marks allowed for this subject.
   (*b*) In another class, his younger brother received 39 marks out of the 60 marks allowed.   Give his marks as a fraction in its lowest terms.
   (*c*) Which brother has received the better mark?

2. In a certain game, Alice won 32 points out of a possible total of 48, and her sister won 21 points out of a possible total of 35.   Whom do you consider the better player, Alice or her sister?

3. I have read 96 pages of a book containing 216 pages.   What fraction of the book have I read?   What fraction of the book remains to be read?

4. Three boys and five girls spent a day's holiday together, and agreed to share the expenses equally.
   (*a*) What fraction of the expenses should be paid by each?
   (*b*) What fraction of the expenses should be paid by the three boys?
   (*c*) If the expenses amounted to 17/–, what would be the total amount paid by the five girls?

5. In a competition, £1 7s. was divided among five boys.
   (*a*) If the first boy received a half, and the second boy a third of the money, what fraction of the money was shared among the other three?
   (*b*) If the last three received equal shares, what fraction of the money did each receive?
   (*c*) What was the amount received by each of the five boys?

6. If $1\frac{2}{3}$ yards of material cost 9/2 what is the cost of 1 yard?

7. A boy cycles at the rate of 1 mile in $5\frac{3}{4}$ minutes.   How long should he take to travel a distance of $3\frac{1}{2}$ miles at this speed?

8. A lorry covered a distance of 80 miles in $3\frac{1}{3}$ hours.   What was its average speed in miles per hour?

USING
A TRY-SQUARE
What is the boy
" trying " ?

XVIII. AREAS

EXERCISE 54. SIZES OF BOOKS AND PAPERS

1. (*a*) Find the area of a postcard $5\frac{1}{2}$ inches long and $3\frac{1}{2}$ inches wide. (See page 55.)
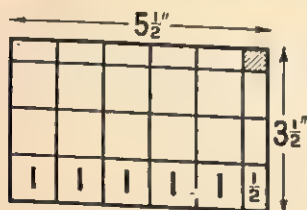
(*b*) Draw a rectangle, $5\frac{1}{2}$ inches long and $3\frac{1}{2}$ inches wide, to represent a postcard, and divide it into inch squares, as shown.

(*c*) What is the size of the square in the top right-hand corner?

(*d*) Find the area of the rectangle by counting the whole squares, the half squares, and the quarter squares. Does this agree with the answer (*a*) above?

2. The first table gives the length and breadth of various sizes of books. Find the area of a page from each book.

Length	Breadth
$7\frac{1}{2}$ in.	5 in.
$8\frac{1}{4}$ in.	$5\frac{1}{2}$ in.
10 in.	$6\frac{1}{4}$ in.
$8\frac{1}{2}$ in.	$6\frac{3}{4}$ in.
$17\frac{1}{2}$ in.	$11\frac{1}{4}$ in.

3. A rectangle, having an area of 63 sq. in., is $10\frac{1}{2}$ inches long. What is the breadth of this rectangle? (See page 79.)

4. The bottom table gives the areas of five rectangles. Find the missing measurement in each case and then check each answer.

Area	Length	Breadth
$16\frac{1}{2}$ sq. in.	(a)	3 in.
$26\frac{1}{4}$ sq. in.	$3\frac{3}{4}$ in.	(b)
36 sq. in.	(c)	$4\frac{1}{2}$ in.
$22\frac{1}{2}$ sq. in.	(d)	$3\frac{1}{3}$ in.
$11\frac{7}{8}$ sq. in.	$4\frac{3}{4}$ in.	(e)

1. A picture, $5\frac{1}{2}$ inches wide and $8\frac{1}{4}$ inches long, has to be mounted on a sheet of paper, $7\frac{1}{4}$ inches wide and 11 inches long.

    (a) How much wider is the paper than the picture? What is the width of the border which can be allowed at each side?

    (b) If the border at the top has the same width as the borders at the sides, what is the width of the bottom border?
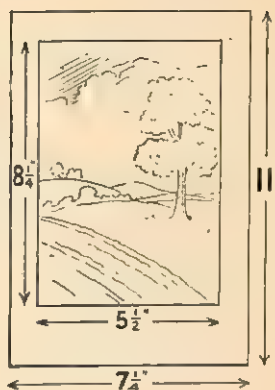
2. A brass plate, $9\frac{1}{4}$ inches long, and $4\frac{1}{2}$ inches wide, is to be mounted on a mahogany panel, 12 inches long and 8 inches wide. The borders at the top and the sides are to be the same width.

    Find the width of (a) the top, and (b) the bottom border.
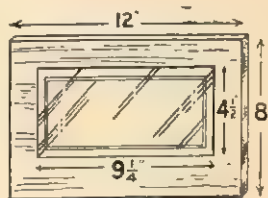
3. The bottom sketch shows a piece of trellis, $18\frac{1}{2}$ inches wide, and made of strips of wood each $\frac{1}{2}$ inch wide. If each of the spaces is a square, find (a) the distance between any two strips and (b) the height of the trellis.
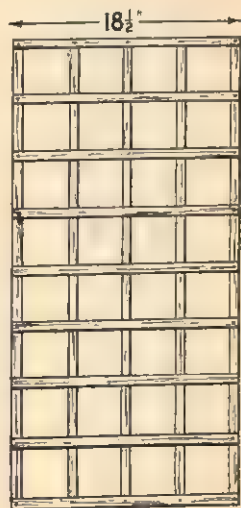
4. (a) A certain sheet of ruled paper has 23 lines. How many spaces are there between these lines?

    (b) What is the distance from the top line to the bottom line, if the lines are $\frac{1}{3}$ inch apart?

    (c) If the sheet of paper is 8 inches long, and the last line is $\frac{1}{4}$ inch from the bottom of the page, what is the width of the space between the top edge of the paper and the top line?

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EXERCISE 56. SQUARE MEASURE

1. (a) How many inches are there in a foot?
   (b) How many square-inches are there in a foot square?

2. (a) How many inches are there in 6 feet?
   (b) How many square-inches are there in a rectangle 6 feet long and 2 inches wide?
   (c) Is this rectangle a foot square?
   (d) Is the area of this rectangle equal to the area of the foot square in Question 1?

3. (a) How many inches are there in 2 feet 8 inches?
   (b) How many square-inches are there in a rectangle 2 ft. 8 in. long and $4\frac{1}{2}$ in. wide?
   (c) Is this rectangle a foot square?
   (d) Is the area of this rectangle equal to the area of a foot square?

> **LEARN**
> A SQUARE-FOOT is an area which is equal to the area of a square having each of its sides 1 foot long.

4. (a) How many square-inches are there in 8 sq. ft.?
   (b) A rectangle, 4 ft. long and 2 ft. wide, is divided into foot squares by horizontal and vertical lines. How many squares are there in the bottom row?
   (c) What is the area of the rectangle in square-feet?
   (d) How many inches are there in 4 feet?
   (e) How many inches are there in 2 feet?
   (f) What is the area of this rectangle in square-inches? Does this agree with the answer obtained in (a)?

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5. (a) A rectangle is 5 ft. 6 in. long and 4 ft. wide.   What is the length and breadth of this rectangle in inches?

(b) What is the area of the rectangle in square-inches?

(c) Divide your answer by 144, and find the area of the rectangle in square feet.

(d) If lines were drawn across this rectangle, dividing it into foot squares, how many square-feet would there be in the bottom row?

(e) How many rows of these squares would there be?

(f) How many square-feet are there in the rectangle?   Does this answer agree with the result you found in (c)?

6. Find the missing figures; then copy out and learn the following:

PARTS OF A FOOT

3 in. = ¼ ft.	1½ in. = * ft.
2 in. = * ft.	4½ in. = * ft.
4 in. = * ft.	7½ in. = * ft.
* in. = ½ ft.	* in. = ¾ ft.
8 in. = * ft.	10½ in. = * ft.

When giving the size of a rectangle, the length and breadth are often joined by the word " by," or by the sign (×).   Thus, a rectangle, 3 feet long and 1¾ feet wide, is given as: 3 feet by 1¾ feet; or as 3 feet × 1¼ feet. 3 feet × 1¾ feet is read as " 3 feet by 1¾ feet " and *not* as " 3 feet multiplied by 1¾ feet."   You cannot multiply by 1¾ feet.

7. Find the area in square-feet of rectangles having the following measurements:

(a) 7′ by 2½′   (b) 5′ 6″ by 3′ 3″

(c) 4½′ by 2¾′   (d) 6′ 9″ by 2′ 8″

8. (a) What is the area of a sheet of glass, 3′ 4″ by 2′ 9″?

(b) What would this glass cost at 6d. a sq. ft.?

9. Measure the length and breadth of the class-room.
   What is the area of the floor: (a) in square-feet?
                                   (b) in square-yards?

```
LEARN

SQUARE  MEASURE
144 sq. in. = 1 sq. ft.
  9 sq. ft. = 1 sq. yd.
```
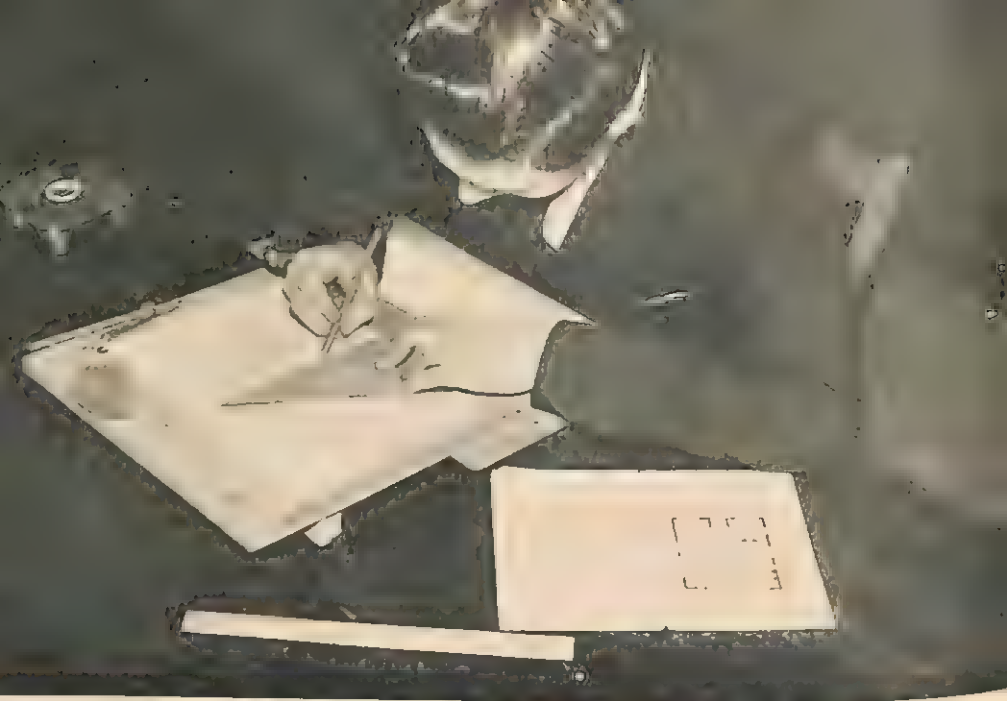
XIX. ANGLES AND CHARTS

EXERCISE 57. MEASURING ANGLES

We have already seen (page 49) that a right-angle is a quarter of a complete turn.   It is, however, often necessary to measure angles which are either greater or smaller than right-angles.   For this purpose, the circle has been divided into 360 equal parts, called **degrees**; that is, each right-angle has been divided into 90 degrees.
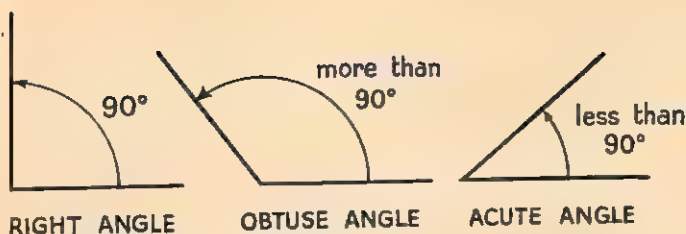
Angles which are smaller than right-angles and contain less than 90 degrees are called **acute angles.**

Angles which are greater than right-angles and are more than 90 degrees are called **obtuse angles.**

A small circle (°) is the sign for degrees.

90 degrees is written as 90°.

RIGHT ANGLE   OBTUSE ANGLE   ACUTE ANGLE
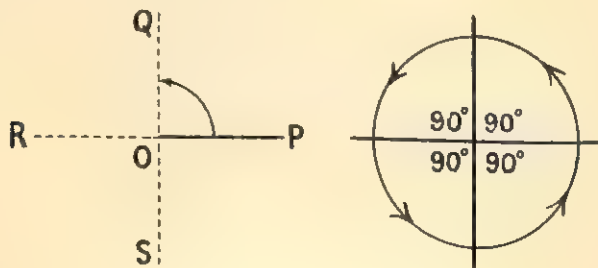
> LEARN
> A CIRCLE   contains 360 degrees.
> A RIGHT-ANGLE   contains 90 degrees.
> AN OBTUSE ANGLE is greater than a right-angle.
> AN ACUTE ANGLE   is smaller than a right-angle.

1. (a) How many degrees are there in half of a right-angle?
   (b) How many degrees are there in a third of a right-angle?
2. What is the size of the angle made by the hands of a clock at   (a) 1,   (b) 4,
   (c) 2,   (d) 5 o'clock?   Give each answer in degrees and state whether
   the angle is acute or obtuse as in the example below:

CLOCK FACE					
SIZE OF ANGLE	90°				
KIND OF ANGLE	Right				

3. The figure on the right shows the face of a
   mariner's compass. Give the number
   of degrees between the following direc-
   tions and state whether the angle is
   obtuse, right, or acute.

   (a) N. and E.
   (b) N. and N.E.
   (c) N. and S.E.
   (d) N.W. and E.
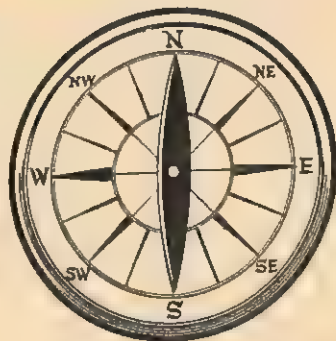
A **protractor** is a drawing instrument used for the measurement and making of angles. It is really a part of a circle, divided into degrees. Examine your protractor very carefully, and note the two rows of figures.
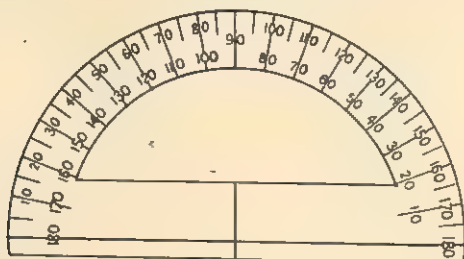

USING OUTSIDE
FIGURES OF
PROTRACTOR

30°   120°
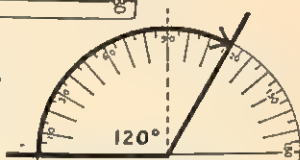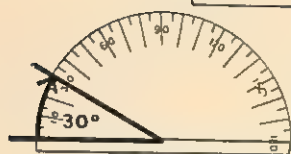
USING INSIDE
FIGURES OF
PROTRACTOR

30°   120°
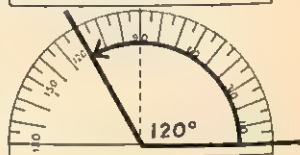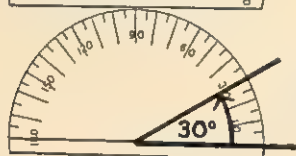
4. (a) Draw any angle. Make each line, or arm, of the angle 2 inches long. Measure the size of the angle with the protractor.

(b) Lengthen the arms of the angle until each line is 3 inches long. Measure the size of the angle now. Have you altered the size of the angle by lengthening the arms?

5. Draw the following angles with the protractor:
   (a) 50°   (b) 70°   (c) 100°   (d) 35°   (e) 115°

6. Draw five angles of any size. *Guess* the number of degrees in each, and then test your skill by measuring the angles with the protractor.

7. Try to draw the following angles without using the protractor. Again test your skill by measuring with the protractor.
   (a) 90°   (b) 45°   (c) 30°   (d) 60°   (e) 120°

8. Examine the back of your ruler. What is the size of the angle shown in the drawing below?
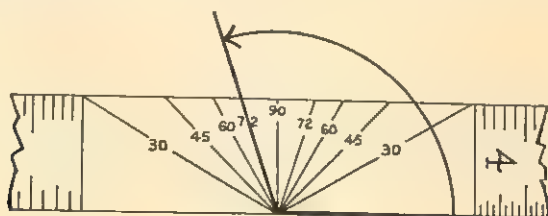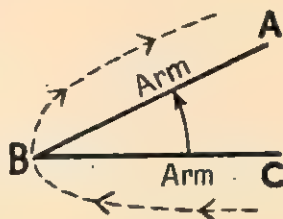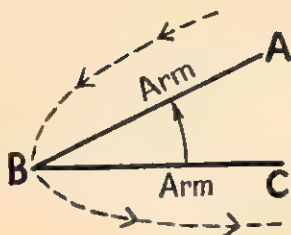
When reading an angle, we start at the end of one of the arms, pass along this arm to the point of the angle, and then along to the end of the other arm.   The angle shown above is read as the angle ABC, or as the angle CBA.   **The middle letter must show where the two arms meet.**   Instead of the word *angle*, the sign ($\frown$) or ($\angle$) is often used, and the angle is then written as:

$$\overset{\frown}{ABC}, \quad \overset{\frown}{CBA}, \quad \angle ABC \quad \text{or} \quad \angle CBA$$

1. Read the following angles, and write your answers in the four different ways shown above.
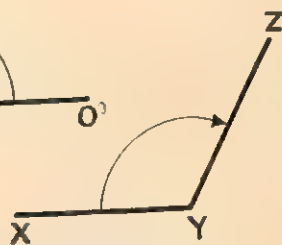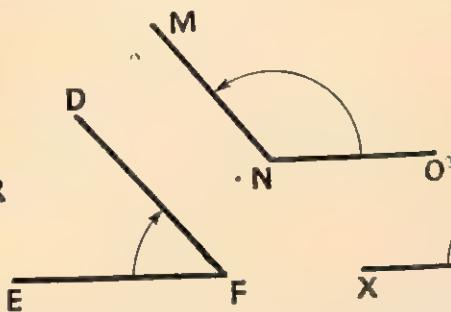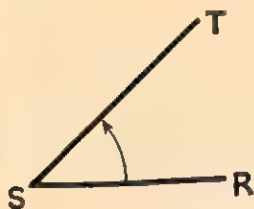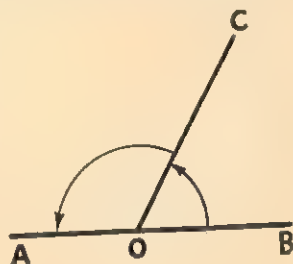

2. (a) Draw any straight line AB.   From a point O, near the middle of the line, draw another straight line, OC, in any direction.
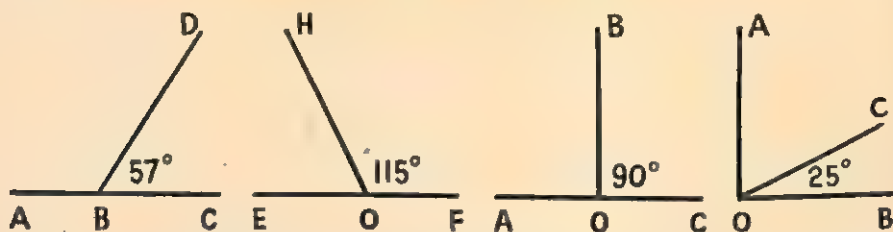
How many degrees are there in the *two* angles AOC. COB?

Measure the angles with your protractor and test.

(b) Draw another figure similar to this one, but draw OC in some other direction.   Measure the angles and find their sum


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3. Examine the figures below. Without measuring, give the sizes of the following: the angle ABD; $\angle$HOE; $\widehat{AOB}$; $\angle$AOC.

4. Using your protractor, make an angle AOB of 43°. Now place the straight edge of the protractor along OB, and make an angle BOC of 137° by the side of the angle AOB. With the ruler, test to see if AO and CO make a straight line.
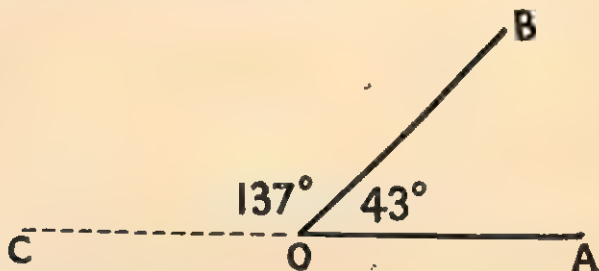

5. Repeat the above exercise, but make the angle BOC equal to 135°. Do the lines AO and CO now make a straight line? Can you give any reason for your answer?
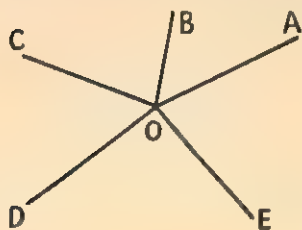

6. From a point O, draw the lines OA, OB, OC, OD, and OE in any direction. Measure the five angles. What is the total number of degrees in these angles?

7. (a) How many angles are there at the centre of this square?
(b) What is the total number of degrees in these angles?
(c) How many degrees are there in each?

100
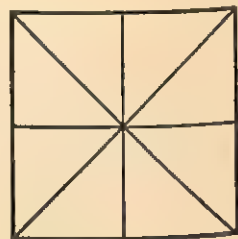
8. Draw an angle AOB of 60°. By the side of this draw another angle BOC of 60°. How many of these angles are needed to complete a circle? Draw these angles. Now place the point of your compass at O and draw a circle. Your figure will look like a wheel. Join the ends of the "spokes" and form a figure having six sides.
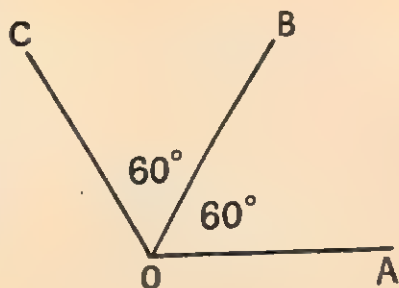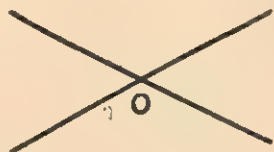
9. (a) A circular pattern is made by fastening together a number of pieces of material shaped as in the sketch. How many of these pieces are needed to complete the circle?
   (b) If the angle of each piece had been 30°, how many pieces would have been needed?

10. What is the size of the angle between the spokes of wheels having (a) 10, (b) 12, (c) 18 spokes?

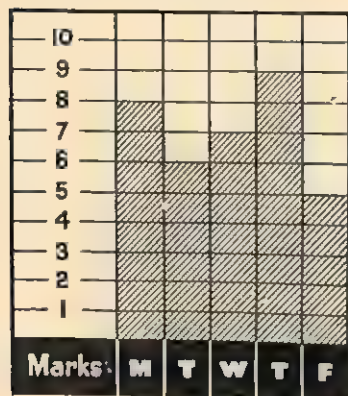11. Draw two straight lines to cross at a point O. Measure the four angles.
    (a) What is the total number of degrees in these angles?
    (b) Are any of these angles equal?

12. How many degrees are there in the angles AOB, BOC, and COD?
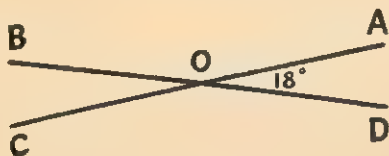
1. This is a copy of a chart made by a girl to show the number of marks she received in her arithmetic lessons. You will see that she received 8 marks on Monday.

(a) How many marks did she receive on Tuesday? Is this higher or lower than the number received on Monday? How has she shown this?

(b) On which day did she receive the highest number of marks?

(c) On which day did she receive the lowest number of marks?

(d) Why do you think she has not shown numbers greater than 10 on the chart?

2. Here is another chart made by a teacher to show the attendances of her class.

(a) How many pupils were present on (i) Monday, (ii) Tuesday, (iii) Wednesday?

(b) What was the highest number of attendances made in this week?

(c) Why do you think the teacher has not shown any number greater than 50 on this chart?

(d) Why has the teacher not shown any number less than 30 on this chart?
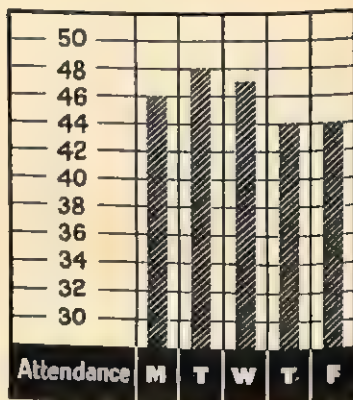
3. (a) It is much easier and quicker to draw such charts on squared-paper. Make a copy of the diagram at the top of the next page. You will see that each day is shown by five small squares along the bottom, or horizontal, line. For each attendance, one small square is taken along the side, or vertical, line.

(b) The attendances for Monday and Tuesday are shown by lines. Draw other lines to show the attendances for the other days of the week, as given in Question 2.

CHART SHOWING ATTENDANCES OF A CLASS FOR A WEEK

DAYS OF THE WEEK
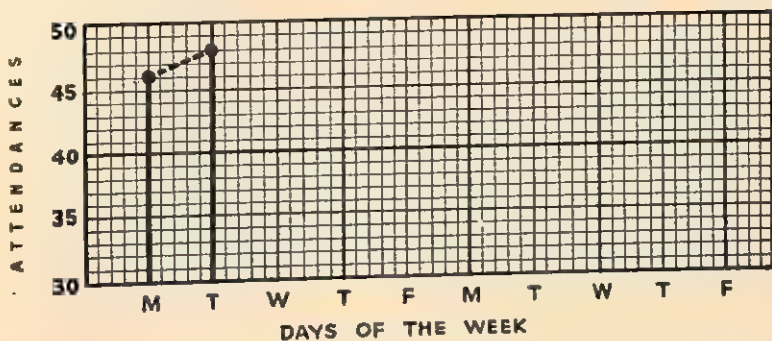
4. Below is a chart showing the attendances made by a school during a certain week.
   (a) How many small squares are taken along the horizontal line for each half-day?
   (b) How many attendances are shown by each small square along the vertical line?
   (c) On which half-day was the attendance (i) highest, (ii) lowest?
   (d) On one of the mornings of this week there was a heavy thunderstorm at 8.30 a.m., and many children were unable to get to school. By the afternoon, however, it was quite fine again. On which day of the week do you think this occurred?


CHART SHOWING ATTENDANCES OF A SCHOOL FOR EACH HALF-DAY OF A WEEK

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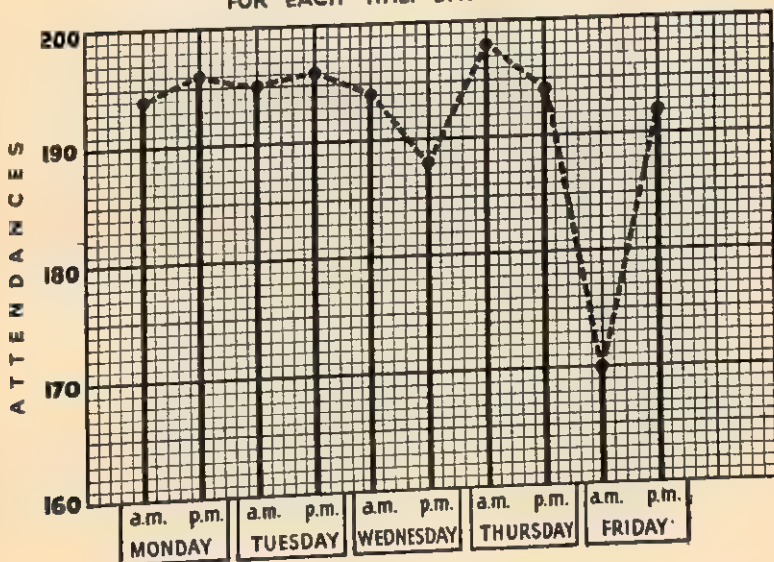
5. Below is a chart showing the marks received by a boy at the end of each week during a term of 10 weeks.

    (*a*) How many small squares are taken along the horizontal line to show one week?

    (*b*) How many small squares are taken along the vertical line to show each mark?

    (*c*) How many marks did the boy receive at the end of the first week?

    (*d*) What was the greatest number of marks received by this boy?

    (*e*) At the end of which week did he receive these marks?

    (*f*) During which weeks was there a " falling-off " in this boy's work?

    (*g*) Is this boy's work getting better or worse during the latter part of the term? How is this shown by the dotted line?

CHART SHOWING THE MARKS OBTAINED DURING A TERM OF 10 WEEKS
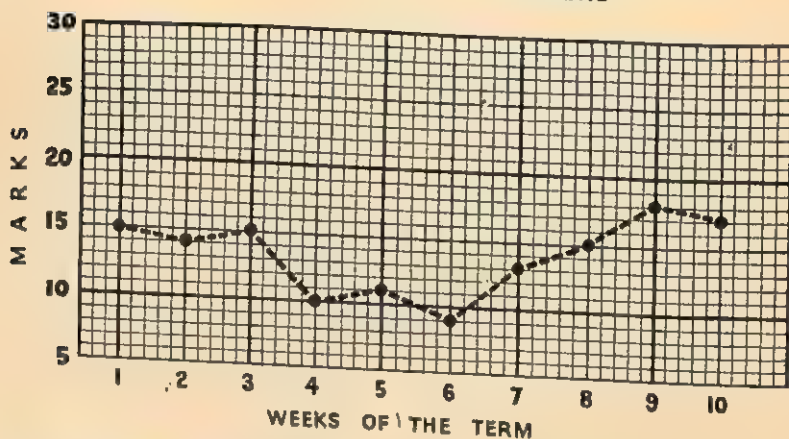
6. The chart below shows the daily " takings " of a shop in a small market town.

Chart showing the takings of a shop for a week.
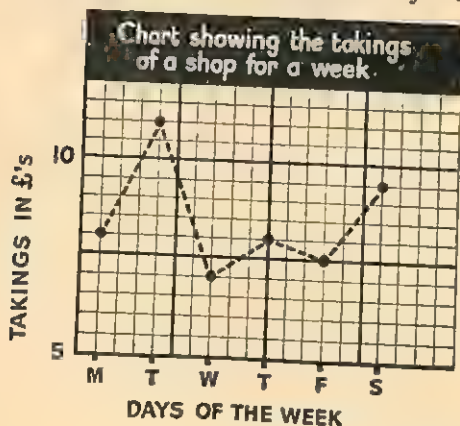
    (*a*) What amount is shown by each small square along the vertical line?

    (*b*) What were the " takings " of this shop on Saturday?

    (*c*) Which day do you think was the *early-closing* day?

    (*d*) Which day was market-day in this town? (*It was not Saturday.*)

XX.° REVISION

EXERCISE 60. LOOKING BACKWARDS

First Glance

1. Find the value of:
  (a) $5\frac{3}{4}d. \times 12$
  (b) $4\frac{1}{2}d. \times 11$
  (c) $11/3 \times 20$
  (d) $3\frac{1}{2}d. \times 13$
  (e) $1/0\frac{1}{2} \times 12$
  (f) $8/9 \times 19$

2. Find the cost of:
  (a) 1 lb. at $2\frac{1}{4}d.$ per oz.
  (b) 8 articles at £1 17s 6d. each.
  (c) 5 oz. at 2/8 per lb.
  (d) 18 articles at 9/11 each.
  (e) 1 lb. 3 oz. at 2/– per lb.
  (f) $17\frac{1}{2}$ lb. at 5d. per lb.

3. Check each item of the following bill. Correct all errors and rewrite the bill in your book.

	£	s.	d.
1 gross of matches at 1/6 per doz. ..		18	0
18 lb. of soap at $5\frac{1}{2}d.$ per lb.		8	6
12 lb. of soda at 3 lb. for $5\frac{1}{2}d.$ ..		1	9
3 brooms at 8/9 each	1	5	7
	2	13	10

4. (a) S. Smith has been employed by J. Jones for $3\frac{1}{2}$ days at 17/3 a day. Make out the bill that Smith would send to Jones. Date the bill for last Saturday.
  (b) Receipt the bill, showing that it was paid to-day.

Second Glance

1. Find the value of:

    (a) $\frac{1}{4}$ of $\frac{1}{5}$ (b) $\frac{3}{4}$ of $\frac{1}{5}$ (c) $\frac{3}{4}$ of $\frac{2}{5}$ (d) $\frac{3}{4} \times \frac{2}{5}$

2. Find the value of:

    (a) $\frac{3}{4} \times \frac{7}{15} \times \frac{5}{14}$ (b) $6\frac{1}{2} \times \frac{8}{15} \div 2\frac{3}{8}$

    (c) $1\frac{1}{8} \times 4\frac{2}{3} \times 1\frac{3}{7}$ (d) $8\frac{1}{4} \times 2\frac{2}{3} \div 1\frac{1}{2}$

3. What is the perimeter of a figure having 12 equal sides, if each side is $1\frac{5}{6}''$ long?

4. Find the value of the following by writing them in the form of vulgar fractions and cancelling:

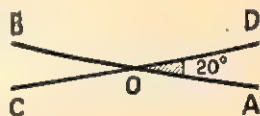   (a) $18 \times 14 \div 21$ (b) $432 \div 64$ (c) $81 \times 24 \div 36$
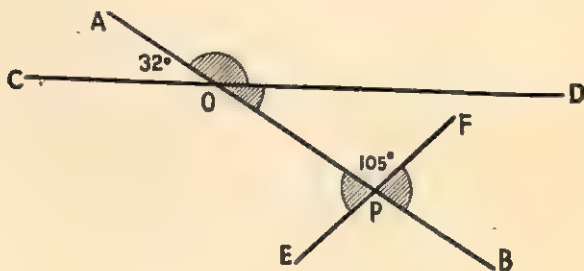
Third Glance

1. Find the area of a sheet of paper $18\frac{3}{4}$ inches by $10\frac{1}{2}$ inches.

2. What is the volume of a box 6 inches long, $2\frac{1}{2}$ inches wide, and 3 inches deep?

3. Give the number of degrees in each of the angles DOB, BOC, and COA, if $\angle$ AOD $= 20°$.

4. Name and give the number of degrees in each of the shaded angles below:

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Set A. Addition

1. Find the sum of: Twenty thousand, two hundred and seven; five thousand and thirty-three; ten thousand and ten; and fifteen thousand, one hundred and fifty.

2.
```
4,756
2,937
  739
2,970
  599
```

3.
£	s.	d.
5	16	$7\frac{1}{2}$
23	17	$9\frac{3}{4}$
76	10	$8\frac{1}{2}$
14	7	$10\frac{3}{4}$

4.
st.	lb.
3	10
2	$7\frac{1}{2}$
6	$11\frac{1}{2}$
1	$1\frac{3}{4}$

5.
ft.	in.
8	9
3	$6\frac{1}{2}$
5	$11\frac{1}{2}$
5	$10\frac{1}{2}$

6.
hr.	min.
1	50
	55
2	10
1	35

7. $\frac{5}{12} + \frac{3}{8} + \frac{2}{3}$

8. $\frac{2}{3} + \frac{5}{9} + \frac{3}{4}$

9. $2\frac{3}{4} + 5\frac{5}{6} + 1\frac{1}{3}$

10. $7\frac{1}{2} + 1\frac{3}{10} + 2\frac{4}{5}$

Set B. Subtraction

1. Find the difference between eleven times 177 and five times 98.

2.
```
56,007
19,988
```

3.
s.	d.
18	$2\frac{1}{4}$
10	$7\frac{3}{4}$

4.
ml.	fur.	chn.
5	6	3
2	7	7

5.
yd.	ft.	in.
15	1	6
9	2	9

6.
lb.	oz.
8	$10\frac{1}{4}$
5	$13\frac{3}{4}$

7. $6\frac{2}{3} - 1\frac{3}{4}$

8. $\frac{1}{2} - \frac{7}{8} + \frac{5}{6}$

9. $2\frac{13}{16} + 3\frac{5}{8} - 4\frac{3}{4}$

10. $5\frac{1}{2} - 1\frac{3}{4} + 2\frac{2}{3}$

Set C. Reduction

1. £6 13s. 9d. to threepences.
2. 305 lb. to st. lb.
3. 3 ml. 5 fur. 5 chn. to chn.
4. 189 pt. to gal. qt. pt.
5. 608 twopences to £ s. d.

Set D. Multiplication

1. Multiply one thousand and eighty-two by three hundred and six.
2. 4,398 × 79
3. $\frac{3}{8} \times 5$
4. $2\frac{1}{2} \times 1\frac{3}{5}$
5. 13 tons 9 cwt. 3 qr. × 17
6. $\frac{2}{5} \times \frac{5}{8}$
7. $1\frac{1}{8} \times 1\frac{2}{3}$
8. $\frac{2}{5} \times 7$
9. $\frac{4}{9} \times \frac{5}{8} \times \frac{3}{5}$
10. $2\frac{3}{4} \times 4\frac{1}{2} \times 1\frac{1}{3}$

Set E.   Division

1. $4,997 \div 7$

2. 19 yd. 2 ft. 6 in. $\div 7$

3. $2\frac{4}{5} \div 2\frac{1}{3}$

4. $56,008 \div 11$

5. 41 cwt. 3 qr. 16 lb. $\div 23$

6. $5\frac{1}{2} \div 2\frac{1}{5}$

7. $49,305 \div 37$

8. $\frac{3}{4} \div \frac{9}{10}$

9. $23,800 \div 41$

10. $\frac{3}{5} \div \frac{6}{7}$

Set F.   Bills

Find the totals of the following:

1. 6 lb. paint at $9\frac{1}{2}d$. per lb.
2 brushes at $11d$. each.
2 lb. nails at $2\frac{1}{2}d$. per lb.

2. $2\frac{1}{2}$ lb. bacon at 1/4 per lb.
$\frac{3}{4}$ lb. cheese at 1/2 per lb.
$1\frac{1}{2}$ doz. eggs at 1/8 per doz.

3. 3 lb. apples at $3\frac{1}{2}d$. per lb.
2 cabbages at $1\frac{1}{2}d$. each.
8 lb. potatoes at 2 lb. for $2\frac{1}{2}d$.
14 lb. flour at $2\frac{1}{2}d$. per lb.
$1\frac{1}{2}$ lb. lard at $7d$. per lb.

4. $3\frac{1}{2}$ lb. butter at 1/1 per lb.
10 loaves bread at $4\frac{1}{2}d$. each.
7 pints milk at $6d$. per qt.
$1\frac{1}{2}$ doz. eggs at 1/10 per doz.
1 lb. tea at $7\frac{1}{2}d$. per $\frac{1}{4}$ lb.

5. 4 yd. material at 2/7 a yd.
$1\frac{3}{4}$ yd. lining at 1/8 a yd.
2 reels of cotton at $1\frac{1}{2}d$. each.

Set G.   Areas

Find the area of rectangles having the following measurements:

1. $10\frac{1}{2}''$ by $4''$

2. $6'$ by $3'\ 2''$

3. $4'\ 3''$ by $2'\ 6''$

4. $10'\ 8''$ by $5'\ 3''$

5. 7 yd. 1 ft. by $4\frac{1}{2}$ yd.

PROTRACTORS

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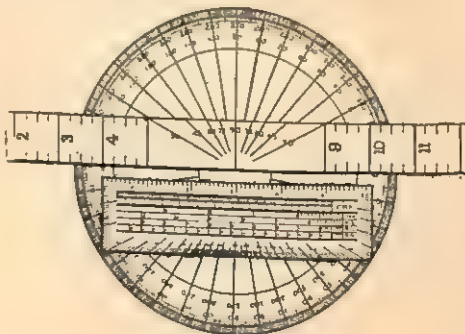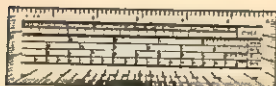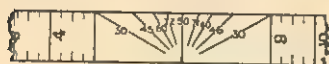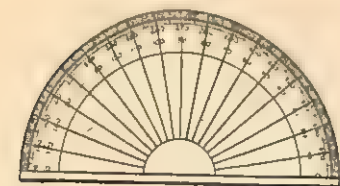
WHAT YOU HAVE LEARNED

In Book 1, you have learned :

1. The " four rules " ; that is, how to add, subtract, multiply, and divide:
   - (a) Simple numbers
   - (b) Money
   - (c) Weights and measures
   - (d) Vulgar fractions.

2. How to find the area of a rectangle.

3. How to find the volume of a box.

4. How to write a bill.

5. How to draw and measure angles.

6. How to read a chart.

<table>
<tr><td>£</td><td>s.</td><td>d.</td></tr>
<tr><td>1</td><td>16</td><td>7 × 18</td></tr>
<tr><td></td><td></td><td>18</td></tr>
<tr><td>32</td><td>18</td><td>6</td></tr>
<tr><td>14</td><td>10</td><td>126</td></tr>
<tr><td>18</td><td>108</td><td></td></tr>
<tr><td>32</td><td>180</td><td></td></tr>
<tr><td></td><td>298</td><td></td></tr>
</table>

<table>
<tr><td></td><td>£</td><td>s.</td><td>d.</td></tr>
<tr><td></td><td>1</td><td>2</td><td>9</td></tr>
<tr><td>17)</td><td>19</td><td>6</td><td>9</td></tr>
<tr><td></td><td>17</td><td>40</td><td>144</td></tr>
<tr><td></td><td>2</td><td>46</td><td>153</td></tr>
<tr><td></td><td></td><td>34</td><td>153</td></tr>
<tr><td></td><td></td><td>12</td><td></td></tr>
</table>

£5 3s. 6d. = 103s. 6d. = 207 sixpences.

247 threepences = 61s. 9d. = £3 1s. 9d.

$$\frac{£2 \ 5s. \ 6d.}{3s. \ 6d.} = \frac{45s. \ 6d.}{3s. \ 6d.} = \frac{91 \ \text{sixpences}}{7 \ \text{sixpences}} = 13$$

If the answer to a sum is £5 17s. 4¾d., it can be given in any one of the following ways:
- (a) £5 17s. 5d. (correct to the nearest penny)
- (b) £5 17s. 6d. (correct to the nearest sixpence)
- (c) £5 17s. (correct to the nearest shilling)
- (d) £6 (correct to the nearest pound)

The value of a fraction is not altered by multiplying, or dividing, the numerator and denominator by the *same* number.

$\frac{5}{6} = \frac{15}{18}$ (Multiplying the numerator and denominator by 3)

$\frac{12}{24} = \frac{1}{2}$ (Dividing the numerator by and denominator by 12)

$$2\frac{1}{2} - 3\frac{2}{3} + 3\frac{3}{4} = 2\frac{6-8+9}{12} = 2\frac{7}{12}$$

$$\frac{3}{4} \times 2\frac{1}{2} = \frac{3}{4} \times \frac{5}{2} = \frac{15}{8} = 1\frac{7}{8}$$

$$\frac{2}{3} \div 2\frac{1}{2} = \frac{2}{3} \times \frac{2}{5} = \frac{4}{15}$$

Find the value of : $35 \times 24 \div 56$

$$35 \times 24 \div 56 = \frac{\overset{5}{\cancel{35}} \times \overset{3}{\cancel{24}}}{\underset{\underset{1}{8}}{56}} = 15$$

Area of rectangle	Volume of box	Perimeter of rectangle
$= l \times b$	$= l \times b \times h$	$= 2(l+b)$
or $A = lb$	or $V = lbh$	or $P = 2(l+b)$

$$ab = a \times b \qquad abc = a \times b \times c \qquad 2a = 2 \times a$$
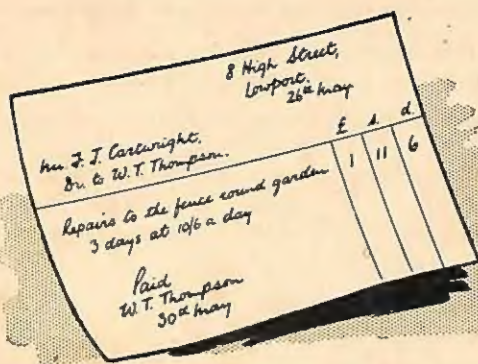
110

8 High Street,
Lowport.
26th May

Mrs. F. J. Cartwright.
Dr. to W. T. Thompson.

Repairs to the fence round garden
3 days at 10/6 a day

	£	s.	d.
	1	11	6

Paid
W. T. Thompson
30th May

To MULTIPLY BY 10, move the figures one place to the left.

To MULTIPLY BY 100, move the figures two places to the left.

Noughts are used to show which columns are empty.

X To the left X

H	T	U
		5
	5	0
5	0	0

÷ To the right ÷

H	T	U
5	0	0
	5	0
		5

To DIVIDE BY 10, move the figures one place to the right.

To DIVIDE BY 100, move the figures two places to the right.

A CIRCLE — contains 360 degrees
A RIGHT-ANGLE — contains 90 degrees
AN OBTUSE ANGLE — is greater than a right-angle
AN ACUTE ANGLE — is smaller than a right-angle

90° 90°
90° 90°

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